



Economics of Reproductive and Infant Health: An Annotated Bibliography From 1980 to 1993

December 1995



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
Division of Reproductive Health

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Preface

For the foreseeable future, public health professionals can expect fiscal concerns to heavily influence health and prevention policies. Without a thorough understanding of the costs and the impact of health services, we run the risk of losing resources to provide these services. No matter how compelling the arguments of need, equity, or compassion are, policymakers will need evidence of economic efficiency to accompany information on health improvement. Without such cost-related data, those of us who advocate for the health and well-being of women and children will be diminished in our effectiveness.

To address this need, the Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, has assembled relevant literature on economic issues in reproductive health. This annotated bibliography covers published reports from 1980 to 1993 and includes 266 abstracted articles and 238 additional references. It addresses a wide range of concerns in women's and children's health and presents studies on cost-benefit, cost-effectiveness, cost utility, and other economic analyses. Along with studies of specific conditions, it includes articles related to methodology in economic analysis that will aid us all in becoming more informed users of economic reports. Although our literature search may not have identified all relevant material, we believe that this bibliography provides useful information on the state of knowledge in this field as it relates to reproductive health.

A review of the articles presented in this bibliography indicates that much information is already available on the economics of women's and children's health. For example, some topics, such as neonatal intensive care and birth defects screening services, have received extensive attention and analyses. But many gaps still exist. Pediatric passive smoke exposure, for example, is only beginning to be examined from an economic perspective. We hope that this bibliography will aid in highlighting both the depth and the gaps in our current knowledge and will prepare us to make use of what is known and to investigate what remains to be learned.

Readers are cautioned to examine these studies with care because the methods of analysis are not yet standardized—papers with different findings may represent quite different approaches to the issue under investigation. The challenges facing researchers who study the economic health issues concerning women and children include defining the measurements of costs, identifying the services whose costs will be assessed, and defining the duration over which outcomes will be measured. Variations in definitions for each of these variables can produce different conclusions.

As public health workers have always known, we must also recognize that decisions regarding the best use of public resources are not based solely on economic concerns. The most sophisticated techniques of cost measurement cannot describe all the benefits and disadvantages of a specific health program. Furthermore, such decisions must take into account the public's will to act on a health problem even if money is not saved or an intervention is costly. Economic analyses may usefully inform these decisions but are unlikely to provide the complete answer to the question, "Is this health service appropriate?" Even if some highly regarded preventive interventions are found costly for a given impact, such analysis can point researchers toward finding more efficient and less costly approaches.

We hope public health professionals in both practice and academia, clinicians, insurers, and others concerned with the health of women and children will find this a useful compilation. As advocates, we need to give decision makers the factual basis upon which to decide with confidence that fiscal prudence, along with altruistic concern, favors a woman- and child-oriented approach to health care.

How to Use This Publication

Arrangement of Items

Items in this publication are arranged in seven sections: (1) Infant and Child Health; (2) Birth Defects, Mental Retardation, and Chronic Conditions; (3) Maternal Health; (4) Family Planning and Women's Reproductive Health; (5) Nutrition; (6) International Health; and (7) Methods. The sections are divided into several parts. Items in each part are listed in alphabetical order by author. The items are numbered sequentially, beginning with 001.

Space considerations did not allow for abstracting of every item we chose to include in this publication. The nonabstracted items are contained in the Reference Lists at the end of their relevant section and are denoted with an "R" before their sequential number.

Indexes

This publication contains three indexes. The *Title Index* lists document titles. The *Author Index* lists personal and corporate authors. The *Subject Index* lists selected key words describing the content of publications. If you know the title of a publication, use the *Title Index*. If you are looking for a publication produced by a particular person or agency, use the *Author Index*. If you want to identify items in a specific subject area, such as smoking education programs, use the *Subject Index*.

Data Elements

A citation and abstract are listed for each item in this publication. Data elements include the item number, title, form, author or corporate author, source, and abstract.

Sample Description:

<i>Item Number</i>	109
<i>Title</i>	Costs and Benefits of Screening for PKU in Wisconsin.
<i>Form</i>	Journal article.
<i>Author</i>	Barden, H.S.; Kessel, R.; Schuett, V.E.
<i>Source</i>	<i>Social Biology</i> . 31(1-2):1-17, Spring-Summer 1984.
<i>Abstract</i>	Researchers conducted a comprehensive cost-benefit analysis of a screening program to detect newborns with phenylketonuria (PKU) in Wisconsin. Classic PKU is a genetic disorder which, if undetected and untreated during the first few weeks of life, generally results in mental retardation and a variety of other abnormal conditions. Researchers compared monetary costs of the detection and treatment program with the projected benefits (avoided costs) that result from the prevention of the mental retardation associated with the disorder. Investigators determined future costs and benefits using a 4 percent, 7 percent, and 10 percent rate of discount to achieve comparability between the present and future costs. The estimated costs of the State Laboratory of Hygiene for PKU testing for 1 year were \$104,740 for 78,050 samples. Actual costs of collecting a blood specimen for testing were estimated at \$4.60 per collection. Treatment costs for PKU for a 20-year period (discounted at 7 percent) were estimated at \$40,830. Net benefits (benefits minus costs) for detecting and treating one person with PKU were \$208,000 (\$292,000 minus \$84,000) using the 7 percent rate of discount. Net benefits for detecting four persons with PKU per year in Wisconsin totaled \$832,000, a large rate of return on a relatively small investment. 10 tables, 42 references.

Obtaining Additional Information

Questions about this publication may be directed to:

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Infant and Child Health

Preterm Birth and Neonatal Care

001

Guidelines for Health Technology Assessment: The Efficacy, Effectiveness, and Efficiency of Neonatal Intensive Care.

Form: Journal article.

Author: Bennett, K.J.; Feeny, D.; Guyatt, G.H.; Tugwell, P.; Drummond, M.F.
Source: *International Journal of Technology Assessment in Health Care.*
1(4):873-892, 1985.

Abstract: Researchers discussed the efficacy, community effectiveness, and efficiency of neonatal intensive care (NIC). They used the Technology Assessment Iterative Loop (TAIL) as a comprehensive framework for evaluating health care technologies and their impact on community health. TAIL contained seven steps: (1) Burden of illness, (2) efficacy (therapeutic potential), (3) diagnosis and screening, (4) community effectiveness, (5) efficiency, (6) synthesis and implementation, and (7) monitoring and reassessment. Efficacy and community effectiveness guidelines determined (1) the appropriateness of the question, (2) whether the design of the studies was sufficiently rigorous for making policy decisions, (3) whether the intervention avoided bias, (4) the accuracy of the measurement of all relevant outcomes, (5) whether the results were applicable to the setting, and (6) the validity of the data analysis. The authors evaluated current studies on NIC using guidelines in relation to morbidity and mortality and quality of life years (QALY). They stated that a study by Boyle et al. that evaluated NIC for infants less than or equal to 1,500 grams, was the best evidence upon which to base estimates of impact. Boyle et al. showed an overall decrease from 58.7 to

39.2 percent in neonatal mortality for very low birthweight infants, and a 19.5 percent absolute decrease or a 33 percent risk reduction in mortality. Examination of the results by birthweight group showed that the mortality reduction was greater in the 1,000-1,499 gram group than the 500-999 gram group (1,000-1,4999 gram group: 36.6 to 21.6 percent or 41 percent risk reduction; 500-999 gram group: 88.1 to 69.4 percent or 21 percent risk reduction). Efficiency guidelines determined (1) the appropriateness of the choice of level of approach, (2) the definition of the viewpoint for the analysis, (3) the appropriateness of the relevant range of alternatives, (4) the appropriateness of the selection of the form of economic evaluation, (5) the identification of the relevant range of costs and benefits, (6) the comprehensiveness and accuracy of the estimation of costs and benefits, (7) the distinction between average and marginal costs and benefits, (8) consideration of an allowance for differential timing of costs and benefits, (9) consideration of an allowance for uncertainty in costs and benefits, and (10) the presentation of the results. The authors used the study by Boyle et al. to review efficiency and economic outcomes according to birth class. Total economic outcomes in undiscounted 1978 Canadian dollars were \$92,500 without NIC and \$100,100 with NIC for birthweight 1,000 to 1,499 grams and \$11,000 without NIC and \$43,600 with NIC for birthweight 500 to 999 grams. Measures of economic evaluation of NIC according to birthweight class in 1978 Canadian dollars were for 1,000 to 1,499 grams: \$59,500 per additional survivor to hospital discharge, \$4,100 per year of life gained to age 15, \$5,100 per QALY to age 15, \$900 per life-year and QALY gained to death,

and \$24,700 net economic benefit per live birth. For birthweight class 500 to 999 grams, the measures were \$102,500 per additional survivor to hospital discharge, \$9,400 per year of life gained to age 15, \$30,900 per QALY to age 15, \$5,100 per life-year and \$9,000 QALY gained to death, \$3,700 net economic loss per live birth, \$600 net economic cost per year of life gained, and \$1,000 per QALY gained. Discounted at 5 percent in 1978 Canadian dollars, for 1,000 to 1,499 grams, the net economic loss was \$2,600 per life gained, \$900 net economic cost per life-year gained, and \$1,000 net economic cost per QALY gained. For 500 to 999 grams, the net economic loss was \$16,100 per life gained, \$7,300 net economic cost per life-year gained, and \$17,500 net economic cost per QALY gained. The authors conclude that NIC is an effective intervention for the care of low birthweight neonates, especially for the 1,000 to 1,499 gram group. For the 500 to 999 gram group increased survival rates are less and NIC is less effective in terms of the resulting quality of life for survivors.

002

Economic Evaluation of Neonatal Intensive Care of Very-low-birth-weight Infants.

Form: Journal article.

Author: Boyle, M.H.; Torrance, G.W.; Sinclair, J.C.; Horwood, S.P.

Source: *New England Journal of Medicine*. 308(22):1330-1337, June 2, 1983.

Abstract: Researchers evaluated the economic aspects of neonatal intensive care of very-low-birthweight infants (less than 1,500 grams) using outcomes and costs of care before and after the introduction of a regional neonatal intensive care program. The study made comparisons from birth to the time of hospital discharge, to age 15, and to the time of death. The study included (1) 373 very-low-

birthweight infants born live to residents of Hamilton-Wentworth County in Ontario, Canada, from July 1964 to December 1969 and (2) 265 very-low-birthweight infants born live in the same county from January 1973 to December 1977. Researchers calculated the incremental costs, effects, and earnings associated with the provision of neonatal intensive care in the county. Costs included neonatal intensive care costs and followup costs to the health care sector and other sectors. All costs were expressed in 1978 Canadian dollars. Effects included numbers of lives saved, life-years gained, and quality-adjusted life years (QALY) gained. Researchers subtracted earnings from costs to yield a net economic cost. Data analysis indicated neonatal intensive care increased both survival rates and costs. Among infants weighing 1,000 to 1,499 grams, 133 of 213 (62.4 percent) survived without intensive care as compared with 129 of 167 infants (77.2 percent) who survived in the intensive-care era. Among infants weighing 500 to 999 grams, the survival rate with intensive care increased from 17 of 160 (10.6 percent) to 22 of 98 (22.4 percent). The projected survival rate to age 15 per live birth for infants weighing 1,000 to 1,499 grams who survived without intensive care was 9.0 and for infants who received the intensive care was 11.1. The projected survival rate to age 15 per live birth for infants weighing 500 to 999 grams who survived without intensive care was 1.46 and for infants who received the intensive care was 3.37. Projected QALY's per live birth to death for infants weighing 1,000 to 1,499 grams who survived without intensive care were 27.4 as compared with 36.0 for infants who received intensive care. Projected QALY's per live birth to death for infants weighing 500 to 999 grams who survived without intensive care were 5.5 as compared with 9.1 for infants who received intensive care. Projected earnings per live birth to death for infants weighing 1,000 to 1,499 grams

who survived without intensive care were (in 1978 Canadian dollars) \$122,200 as compared with \$154,500 for infants who received intensive care. Among infants weighing 500 to 999 grams, projected earnings per live birth to death before intensive care were \$19,200 and after intensive care were \$48,100. By every measure of economic evaluation, the impact of neonatal intensive care was more favorable among infants weighing 1,000 to 1,499 grams than among those weighing 500 to 999 grams. 2 figures, 4 tables, 36 references.

003

Neonatal Intensive Care and Cost Effectiveness.

Form: Journal article.

Author: Chance, G.W.

Source: *Canadian Medical Association Journal.*

139(10):943-946, November 1988.

Abstract: During the past decade, the rate of death among newborns weighing less than 1,500 grams at birth has decreased by approximately half. The reduction is due in part to the application of research findings and technological advances, but it is very expensive. The overall prevalence of disabilities in infants is relatively unchanged. Recently, researchers have begun viewing neonatal intensive care as a possible area for cost containment. Based on a cost-benefit analysis, Walker and colleagues concluded that neonatal intensive care for infants weighing less than 900 grams at birth may not be justified. A review of literature on the cost of neonatal intensive care and the limited information available on other expensive medical programs found that the cost of neonatal intensive care compares favorably with that of other expensive medical programs, especially for infants weighing 1,000 to 1,500 grams at birth. According to one Ontario

study, for newborns weighing 1000 to 1500 grams the neonatal cost was \$59,500 for each additional survivor, \$2,900 for each life-year gained and \$3,200 for each life-year gained adjusted for quality of life. The corresponding costs for newborns weighing 500 to 999 grams were \$102,500, \$9,300, and \$22,400. On the basis of cost per quality-adjusted life-year, the neonatal intensive care for infants weighing between 1,000 and 1,499 grams at birth compared favorably with (1) screening for thyroid disorders, (2) treatment of men with hypertension, (3) coronary artery bypass surgery for patients with single-vessel disease and moderate-to-severe angina, (4) continuous ambulatory peritoneal dialysis, and (5) in-hospital hemodialysis. The extent of increase in survival rates frequently seems to be overlooked in considerations of the restriction of neonatal intensive care application. In Sweden, the application of modern perinatal intensive care increased the overall survival rate of infants weighing less than 1,500 grams at birth by 3.8 per 1,000 live births; however, the increase was accompanied by an increase of 0.1 children with cerebral palsy per 1,000 live births. Before health professionals make decisions to limit neonatal intensive care on the basis of gestational age or birthweight, they (1) should obtain better information on the outcome of infants of very low birthweight, (2) should conduct comparable rigorous studies of the cost effectiveness of other expensive medical programs, and (3) should consider other, less easily quantified factors. Decision makers should use the best available information to make choices on behalf of newborns. 1 table, 21 references.

004

Citywide Neonatal Program. Ten Years Experience.

Form: Journal article.

Author: Chiu, T.; Garrison, R.D.;

Lilly, V.S.; Lim, M.O.; Rawlings, D.J.

Source: *Journal of the Florida Medical Association.* 77(2):101-104, February 1990.

Abstract: Researchers describe a citywide neonatal program initiated in Jacksonville, Florida, in July 1978 and its progress through December 1988. The program instituted contractual agreements with all hospitals providing obstetrical services in the metropolitan area to provide neonatal coverage for the city in a cooperative rather than competitive fashion, mainly to insure the availability of Level Two stepdown neonatal care. Admissions, occupancy rate, and patient care days served by the Regional Perinatal Intensive Care Center (RPICC) and the Level Two nurseries had increased to capacity. More stepdown care beds were made available by this cost-effective program. In 10 years, 7,337 infants were transferred to the affiliated Level Two nurseries in Jacksonville for care. Estimated average cost for 237 infants in the RPICC would have amounted to \$2,031,120 for 14 days in 1988. Actual cost after transfer from the RPICC to the stepdown care units was \$1,638,600, a total estimated savings of \$392,520, or \$1,808 per patient. In comparison, in 1981 the savings was \$923 per patient for 116 infants, demonstrating the rise in cost savings from the program. Major achievements of the program include the physician extender coverage system; standardization of forms, charts, and protocols; and better understanding of the program by the health maintenance and preferred provider organizations so that patients can be freely transferred between the participating hospitals based on medical needs rather than insurance guidelines. The program

is more cost-effective than traditional competitive models and helps decrease the liability exposure of individual hospitals. Cities with only one Level Three center should explore the possibility of establishing this type of program. 3 tables, 6 references.

005

Surfactant Replacement Therapy in Neonates Less Than 32 Weeks Gestation: Effect on Neonatal Intensive Care Resource Utilization.

Form: Journal article.

Author: Diwaker, K.; Roberts, S.; John, E.

Source: *Journal of Paediatrics and Child Health.* 29(6):434-437, December 1993.

Abstract: Researchers studied the effect of synthetic surfactant (Exosurf) replacement on complications from hyaline membrane disease (HMD) in infants less than 32 weeks gestation and their resource utilization within a neonatal intensive care unit at Westmead Hospital, New South Wales, Australia during 1991-1992. A control group was selected from infants admitted to the same unit during the preceding 3 years when Exosurf was not available. The study group consisted of all infants (192) less than 32 weeks gestation treated with Exosurf for HMD at Westmead Hospital during 1991-1992. One hundred fifty-five different procedures in 192 infants were studied; the majority of procedures were studied on 10 different occasions. The cost of each level of care for each of the 192 infants was calculated based on the activities around the infant, documented over 24-hour periods. Cost of medical care was determined by observing the level of activity around a cohort of patients of varying gestation and disease states, by an independent observer (SR). Each activity was timed and the equipment and consumable items used documented. The cost of each procedure was calculated based on actual time spent by

personnel doing the procedure, the cost of consumables, and the depreciation of capital equipment used. Researchers calculated the average cost per day per infant in 1990 Australian dollars at four levels of nursing care in nurse:patient ratio: (1) for an unstable infant, level 1:1, \$1,286.94; (2) for a stabilized infant, level 1:2, \$622.83; (3) for an infant who had been extubated but required constant monitoring and total parenteral nutrition, level 1:3, \$376.67; and (4) for an infant who required no life support but needed cardio-respiratory monitoring, level 1:4, \$265.57. The cost of care for an unstable infant was twice the cost of care of an infant who had stabilized and nearly four times the cost of care of the infant who had been extubated. A total of 82 infants with moderate to severe HMD were studied, 41 of whom were born in 1991 and were given Exosurf. The 41 control infants were born during 1988-90 and had not received any form of artificial surfactant. Infants given Exosurf had a significant reduction in the incidence of pulmonary interstitial emphysema (PIE), and a marginal decrease in the incidence of pneumothorax. In assessing benefits of Exosurf in infants born between 24-26 weeks, 27-29 weeks, and 30-31 weeks, it was evident that the benefit was more marked in the older gestational groups. In the infants born between 24-26 weeks (4), the number of days in intermittent mandatory ventilation (IMV) was 11.5 for the Exosurf study group and 16.5 for the control group, and the costs per group in 1990 Australian dollars were \$40,467 for the Exosurf group and \$48,359 for the control group. In the infants born between 27-29 weeks (19), the number of days in IMV was 7.5 for the Exosurf study group and 11 for the control group, and the costs per group in 1990 Australian dollars were \$28,079 for the Exosurf group and \$38,818 for the control group. In the infants born between 30-31 weeks (12), the number of days in IMV was 4.5 for the Exosurf study group and 6 for the

control group, and the costs per group in 1990 Australian dollars were \$13,973 for the Exosurf group and \$20,166 for the control group. The older infants required fewer days on the ventilator and consumed less of the scarce financial resources. There was no difference in the mortality rate among the two groups. Exogenous surfactant is effective in reducing short-term morbidity and cost of intensive care in preterm infants with HMD. 5 tables, 17 references.

006

Increasing the Survival of Extremely-immature (24 to 28 Weeks' Gestation) Infants: At What Cost?

Form: Journal article.

Author: Doyle, L.W.; Murton, L.J.; Kitchen, W.H.

Source: *Medical Journal of Australia.* 150(10):558-563, 567-568, May 15, 1989.

Abstract: Researchers at the Royal Women's Hospital in Melbourne, Australia, studied live-born infants of 24-28 weeks' gestation during 1977-1983 (616 infants) and during 1984-1986 (193 infants) to determine the cost-effectiveness of intensive care up to the time of hospital discharge over two separate eras of stable consumption of resources for assisted ventilation. Researchers also compared costs (consumption of nursery resources) and outcomes (survival) among three eras: 1971-1974, 1977-1983, and 1984-1986. For each infant who was born during 1977-1986, the number of patient days that were consumed for assisted ventilation, the number of patient days of stay in the intensive care unit, and the number of patient days of stay in the special care nursery were recorded. The number of patient days in the intensive care unit without assisted ventilation and the number of patient days in the special care nursery were converted into equivalent numbers of patient

days of assisted ventilation by assuming their worth in proportion to the nurse-patient ratios that are usually assigned to the respective levels of care: One patient day of assisted ventilation equals two patient days in the intensive care unit with no ventilation, which equals three patient days in the special care nursery. Dollar costs, in Australian dollars for 1986-1987, were multiplied by the equivalent number of patient days of assisted ventilation that were consumed to estimate the expenses. During 1977-1983, compared with producing one survivor at 28 weeks' gestation, producing one survivor at 24 weeks' gestation consumed 14.4 times the number of patient-days of assisted ventilation (168.25 patient days for one survivor at 24 weeks' gestation versus 34.32 patient days for one survivor at 28 weeks' gestation); the cost-effectiveness of intensive care during this period decreased with decreasing maturity. The overall cost-effectiveness up to the time of hospital discharge for infants of 24 to 28 weeks' gestation during 1977-1983 (an era of moderate assisted ventilation) compared with 1971-1974 (when assisted ventilation was rare) was A\$62,268 per additional survivor. After 1983, the consumption of resources for assisted ventilation more than doubled in infants of 24 to 28 weeks' gestation. However, there was a diminishing return with respect to the gains in survival during 1984-1986 and the costs per additional survivor averaged A\$99,574, which was 60 percent more than costs for 1977-1983. Researchers speculate that improving survival further in the most immature infants by increasing resources for assisted ventilation only can be more difficult and more expensive, and even less cost-effective. 1 figure, 6 tables, 12 references.

007

Financial Impact of the High Technology Newborn.

Form: Journal article.

Author: Edell, D.S.; Banton, D.L.; Browning, I.B.

Source: *North Carolina Medical Journal*. 52(2):97-99, February 1991.

Abstract: Each year, 50,000 high-risk infants are born in the United States and are treated at a cost of \$1.5 billion. The cost for specialized health care of low birthweight babies ranges from \$16,000-\$250,000 per infant. Medical costs for the morbidity of those who survive the neonatal period are astronomical. The average medical care costs of raising a child from birth to age three range from \$22 a month to \$26.80 a month for the northeastern/north central United States and the urban western United States, respectively. Estimated average medical care costs of raising a neonatal intensive care unit graduate until age three are as follows: With no disability, \$62.60/month; with mild developmental disability, \$414.20/month; with moderate/severe developmental disability, \$650.90/month; and with developmental disability and institutionalization, \$1,216/month. In one study, of 60 children released from intensive care and followed until age three, 35 had developmental deficits. The total health care cost after discharge from the intensive care unit was \$336,654. Costs that contributed to this amount included primary health care, hospital emergency room visits, radiological studies, blood tests, specialty clinic visits, and the cost of specialized equipment. When adjusted for birthweight, the neonatal mortality rate in the United States is among the lowest in the world, but at the greatest cost. Society is faced with a situation in which advanced technology has produced the high-tech, high-priced neonate. The burden of the neonatal intensive care graduate

is draining the health care system and will eventually break it, if changes are not instituted immediately. The authors conclude that prevention of low birthweight infants and the resulting high cost mortality and morbidity must become the directive of all concerned.

10 references.

008

Estimated Costs of Different Treatments of the Respiratory Distress Syndrome in a Large Cohort of Preterm Infants of Less Than 30 Weeks of Gestation.

Form: Journal article.

Author: Egberts, J.

Source: *Biology of the Neonate.*

61(Supplement 1):59-65, 1992.

Abstract: Researchers used data from a well-defined population of preterm infants to calculate the costs of various types of treatment to prevent or alleviate respiratory distress syndrome (RDS) in preterm neonates. The study population included 468 preterm babies less than 30 weeks' gestation who were born in the Netherlands in 1983. Of these, 309 (66 percent) developed RDS, of whom 159 (51 percent) babies died; 65 of the 155 infants who did not develop RDS died of other causes. Researchers derived estimates of the effects of corticosteroids or surfactant on the incidence of RDS and the mortality due to RDS from overviews and expressed them as typical odds ratios with 95 percent confidence limits. Daily costs were care-related and the price per day was based on the year-price per bed reported in 1990 by the Central Organization for Tariffs of Health Care in the Netherlands, then corrected for an 80 percent occupancy. The 1990 cost of intensive care and high dependence care was Dfl 1,164 per day and the special care cost was Dfl 510 per day (\$1.00 equals Dfl 1.85). Within a model cohort of 1,000 preterm infants of less than 30

weeks' gestation, the incidence and mortality of RDS change if corticosteroids are used prenatally and surfactant prophylactically or therapeutically after birth. Combined prenatal and postnatal therapies give the best results (approximately 125 extra survivors).

Therapeutic surfactant administration even in combination with prenatal corticosteroids has cost implications (Dfl 67,700; \$36,595) because extra intensive care beds (7-11 percent) are needed. More special care places (12-24 percent) are required after each type of intervention. Estimated costs per extra survivor are the lowest for prenatal corticosteroid administration. The combination of corticosteroids prenatally and surfactant postnatally seems to be most cost-effective because it produces the most survivors and the lowest number of intensive and high dependency care days in hospital. 1 figure, 2 tables, 16 references.

009

Cost of Neonatal Care Across a Regional Health Authority.

Form: Journal article.

Author: Fordham, R.; Field, D.J.; Hodges, S.; Normand, C.; Mason, E.; Burton, P.; Yates, J.; Male, S.

Source: *Journal of Public Health Medicine.* 14(2):127-130, June 1992.

Abstract: Researchers in Great Britain studied 17 hospitals in one regional health authority to examine (1) the relative cost of intensive care and special care for newborns and (2) economies of scale. They collected clinical data for 1987 in two parts, first gathering workload information on a day-to-day basis from each neonatal unit, and then collecting hospital cost information using a 3-stage postal questionnaire with telephone followup. Investigators used multiple regression models to separate out the effects on costs of scale (as

measured by the total numbers of cot days in the unit) from the case mix (measured by the proportion of the days in intensive care). The dependent variable was average cost per cot days (size) and the independent variables were the number of cot days (size) and the proportion of intensive care cases (case mix). The expected costs for a unit providing 1,000 cot days in total were (in 1988 pounds sterling) 467 pounds for intensive care and 181 pounds for special care; for larger units with 3,000 cot days, costs were 380 pounds for intensive care and 113 pounds for special care. There is clear evidence of economies of scale: The quadratic form showed average cost per cot day falling by 50 pounds between 1,000-2,000 cot days, 40 pounds between 2,000-3,000 cot days, but only by 10 pounds per day between 5,000-6,000 cot days. The study lends support to a previous study that found that intensive care is three times as expensive as special care in a typical large hospital. Economies of scale became small above 4,000 cot days (around 13-14 cots). 4 tables, 11 references.

010

Cost of Care of the Less-Than-1000-Gram Infant.

Form: Journal article.

Author: Hernandez, J.A.; Offutt, J.; Butterfield, L.J.

Source: *Clinics in Perinatology*.
13(2):461-476, June 1986.

Abstract: Researchers report their experiences in the management and cost of hospital care of preterm infants weighing less than 1,000 grams who were cared for at the Newborn Center of The Children's Hospital in Denver, Colorado. Between January 1984 and June 1985, 128 outborn infants weighing less than 1,000 grams were admitted to the center and received all their care there until time of discharge. Birthweight ranged from 435 to

1,000 grams and gestational ages ranged from 23-31 weeks. Researchers reviewed patients' records and collected data referring to (1) mortality, (2) duration of hospitalization, and (3) hospital charges. Researchers reviewed hospital records of infants with a birthweight less than 1,000 grams from 1981-1984 to establish survival rate, age at time of death, and length of stay. Provision of care was arbitrarily divided into levels of care: During high intensity and intermediate intensity care (level three), infants received full ventilatory and nutritional support and the nurse-patient ratio was 1:1 or 1:2; during low intensity intensive care and convalescent care (level two), the nurse-patient ratio was 1:2 or 1:3. Charges were identified for level two and level three care in nine categories: (1) Daily room charges, (2) nursing charges, (3) respiratory therapy, (4) blood gas analysis, (5) pharmacy, (6) laboratory, (7) radiology, (8) central supply, and (9) miscellaneous. Physicians' fees were not included. Total and daily charges (bills sent out by the hospital for services) and costs (financial resources the hospital required to provide neonatal care) for all infants (survivors and nonsurvivors) were calculated. The average length of survival for neonatal deaths was 19 days, ranging between 1-162 days. The average length of hospitalization for surviving infants was 89 days, with a range of 49 to 197 days. Costs increased significantly as birthweight decreased and length of stay increased. The average cost for survivors was \$902 and for nonsurvivors \$1,183. Daily average level three care cost \$1,000 per day; of that, approximately 37 percent was for nursing care, 26 percent was for support and management of ventilation and oxygenation, and 20.3 percent was for direct room charges. Daily average level two care cost was \$441 per day; changes in cost derived from nursing care acuity and decreased cost from respiratory therapy, laboratory, and ancillary services. 6 figures, 5 tables, 60 references.

011

Cost Efficiency of Neonatal Nurseries: The Significance of Unit Size.

Form: Journal article.

Author: John, E.; Hind, N.; Roberts, V.; Roberts, S.

Source: *Australian Journal of Public Health.* 15(3):242-244, September 1991.

Abstract: Using data from a larger study in which cost analysis of neonatal intensive care was done prospectively from July 1988 through June 1989, researchers in Australia examined the relationship of neonatal intensive care unit (NICU) size to cost and determined the optimum and minimum size of the unit in terms of cost efficiency. They identified categories of costs within the nursery considered essential for patient care, including costs of (1) personnel, (2) equipment, (3) disposable items, (4) drugs, and (5) food. Requirements for units with 1-16 ventilator cots were determined from published data and discussions with peers. All cost calculations were based on a 100-percent occupancy rate. The major pieces of equipment (i.e., mobile radiographic equipment and blood gas analyzer) were costed at 1989 value and divided by the life span of the equipment to achieve yearly depreciation, which was summed with the maintenance cost and used as the cost of the equipment for the year. Costs were examined for Level three NICU's (ventilator and nonventilator) and Level two's (high-dependency neonatal care). Findings suggest that units with fewer than 6 ventilator cots were less cost-efficient than those with more cots while those with 12 ventilator cots were the most efficient. The calculations were done only up to 16 ventilator cots. Similarly, Level two units were most cost-efficient when attached to an intensive-care unit and had more than 16 cots. Optimal cost efficiency was achieved with 12 ventilator cots, 8 Level three nonventilator cots, 16-20 Level two cots, and a

unit size of 36-40 cots. When incremental costs were considered, the most cost-efficient establishment involved 11-12 ventilator cots with all the required stepdown cots. Larger numbers would be cost-efficient, but the unit could become too large to be clinically efficient. The source document does not provide specific cost information. 2 figures, 2 tables, 11 references.

012

Cost of Neonatal Intensive Care.

Form: Journal article.

Author: John, E.; Lee, K.; Li, G.M.

Source: *Australian Paediatrics Journal.* 19(3):152-156, September 1983.

Abstract: Researchers in Australia analyzed the costs of providing intensive care to inborn babies in an inner city hospital equipped to deal with high-risk obstetrics. Costs included all services, materials, and maintenance related to nursing and medical care for inborn babies in 1981; the hospital had 4,000 births that year. Of 136 babies admitted to the intensive care nursery in 1981, 16 were transferred, leaving 120 babies for consideration. Costs showed the expected inverse proportion to birthweight. Total cost of care for the 120 babies was \$1 million. Average cost per baby was \$8,644. The cost per survivor, adjusted to reflect the fact that survivors are the beneficiaries of the total outlay, was greater (\$10,170) than the average cost, and the cost per year of life saved was \$145. A larger number of more mature babies nevertheless contributed almost two-thirds of the total cost. The adjusted cost per survivor (adjusted to reflect the fact that only the survivors benefit) was \$39,845 for babies less than 801 grams; \$26,100 for those between 801 grams and 1,000 grams; \$14,137 between 1,001 grams and 1,500 grams; and \$4,782 over 1,500 grams. The largest single expense was in

nursing salaries, which constituted 60-80 percent of the total outlay. No data are available for precise comparison. Researchers present these figures as a basis on which to begin forming judgments of the cost effectiveness of newborn intensive care. 6 tables, 18 references.

013

Effect of Antenatal Administration of Betamethasone on Survival of Premature Infants.

Form: Journal article.

Author: Johnson, D.E.; Munson, D.P.; Thompson, T.R.

Source: *Pediatrics*. 65(5):633-637, November 1981.

Abstract: Prenatal administration of glucocorticoids has been shown to decrease the incidence and severity of respiratory distress syndrome in premature infants, but little is known regarding the immediate economic impact of this reduction in respiratory morbidity. This study retrospectively examined 342 infants born during 1978 and 1979 and hospitalized in the University of Minnesota Hospitals. Comparison of survival and the hospital charges for infants whose mothers had not received prenatal glucocorticoid therapy showed that administration of glucocorticoids has a significant effect in lowering mortality in infants with birthweights between 750 and 1,249 grams (27 to 29 gestational weeks). Glucocorticoid therapy was also effective in decreasing morbidity as reflected by hospital charges of surviving infants with birthweights between 1,250 and 1,749 grams (30 to 32 gestational weeks). In both steroid-treated and nontreated mothers, prolongation of gestation decreases hospital charges in a linear fashion. The total hospital charges for infants whose mothers received no antenatal glucocorticoid

therapy decreased \$901 per day spent in utero and decreased \$3,776 per 100 grams of weight gained in utero. Researchers conclude that the noted decrease in hospital costs should not justify prenatal glucocorticoid administration but should stimulate examination of long-term effects of the drug on surviving infants. 3 tables, 2 figures, 28 references.

014

Costs of Neonatal Intensive Care by Day of Stay.

Form: Journal article.

Author: Kaufman, S.L.; Shepard, D.S.

Source: *Inquiry*. 19(2):167-178, Summer 1982.

Abstract: Researchers developed and tested a methodology for calculating the cost of care for a stay in the neonatal intensive care unit (NICU) at a Boston hospital specializing in obstetrics and gynecology. The subjects consisted of a random sample of 10 infants weighing between 751 and 1,000 grams who were discharged in 1977. Only four infants survived. Analysis incorporated all medical costs incurred by the infants during their hospital stay including physician's services and hospital overhead. The data consisted of medical records, medical bills, internal hospital cost reports, hospital financial reports, information from the group practice supervising the medical care in the NICU, and interviews with physicians and hospital employees. Costs were divided into three types: (1) Infant direct costs, (2) unit direct costs, and (3) hospital overhead. Infant direct costs were further divided into four types: (1) Direct nursing care, (2) attending physician care, (3) certain selected supplies, and (4) ancillary services delivered in departments outside the neonatal intensive care unit. Three levels of care (intensive, intermediate, and growth and recovery) within the NICU

accounted for unit direct costs. Within each level, the amounts allocated at each cost component were summed to determine a total unit direct cost by level. These totals were then divided by the total annual number of patient days for all infants in the NICU. Hospital overhead allocated to the NICU was divided among the three levels of care, and total overhead costs and overhead costs per day were computed in the same manner as the unit direct costs. The 10 infants incurred a total cost of \$102,944 over 330 days, for an average cost per day of \$312. The total cost of care for the four surviving infants ranged from \$14,654 to \$40,752 with lengths of stay from 62 to 100 days. Among the six nonsurvivors, five did not survive more than four hours. Total costs for individual infants in this group ranged from \$0 to \$505. A sixth infant survived nine days and accumulated \$7,594 in total costs. Results indicate that the total cost per day declines over the course of an infant's stay and the time spent at a particular level of care. Analysis of infant direct cost showed a similar decline over time, indicating that the pattern of declining costs did not result solely from the stepped allocation of unit direct and overhead costs. 3 tables, 5 figures, 26 references.

015

Cost Analysis of Extremely Low Birthweight Infants: An Update (Editorial Response).

Form: Journal article.

Author: Khadilkar, V.V.; Tudehope, D.I.

Source: *Journal of Paediatrics and Child Health.* 28(5):410, October 1992.

Abstract: The authors respond to a study which conducted a cost analysis for the care of extremely low birthweight (ELBW) infants in Australia for the years 1986 and 1987. They present updated information on the cost per surviving ELBW infant, stating that costs

presented in the previous study may give a misleading impression of how expensive it is to keep an ELBW infant alive. Costs are based on establishing a new neonatal intensive care unit of 43 cots in an existing hospital with available floor space, including operating costs for an average year in the life of the unit. Additional costs of new equipment and increases in the medical and nursing staff salaries were added to the fixed and variable costs and the average cost of each level of patient care was updated. All costs are presented in 1987 Australian dollars for the years studied. In 1989-1990, of the 122 ELBW infants who were either live born at the Mater Mothers' Hospital in Brisbane or admitted to the Intensive Care Nursery, 84 (68.8 percent) survived to hospital discharge compared with a survival rate of 51.9 percent (53 of 102) in 1986-1987. Due to marked improvements in the survival rates for these ELBW infants in the last 5 years, the average cost per survivor decreased from \$68,355 in 1986-1987 to \$56,707 in 1989-1990. The most dramatic change occurred for infants less than 800 grams birthweight (\$120,164 in 1986-1987 to \$87,313 in 1989-1990). The New Life Centre at the Mater Mothers' Hospital opened for clinical use in April 1991 and has an entirely different infrastructure than the previous nursery, so the above method for cost analysis will not be appropriate for further accounting exercises. 1 table, 4 references.

016

Cost of Improving the Outcome for Infants of Birthweight 500-999 g in Victoria.

Form: Journal article.

Author: Kitchen, W.H.; Bowman, E.; Callanan, C.; Campbell, N.T.; Carse, E.A.; Charlton, M.; Doyle, L.W.; Drew, J.; Ford, G.W.; Gore, J.; Kelly, E.A.; Lumley, K.J.; McDougall, P.; Rickards, A.L.; Watkins, A.; Woods, H.; Yu, V.

Source: *Journal of Paediatrics and Child Health.* 29(1):56-62, February 1993.

Abstract: Researchers conducted an economic evaluation of neonatal intensive care for extremely low birthweight (ELBW) infants, between 500 and 999 grams, born in Victoria, Australia. In Victoria, the outcome to 2 years of age for infants of birthweight 500 to 999 grams improved between 1979-80 to 1985-87, with not only a higher survival rate, but also a lower rate of neurological morbidity in survivors at 2 years of age. Followup data at 2 years of age were available for all 89 survivors from the 351 live births in 1979-80 and for 211 of the 212 survivors from the 560 live births in 1985-87. Researchers assigned the following utilities to neurological disabilities: (1) No disability, 1.0; (2) mild, 0.8; (3) moderate, 0.6; (4) severe, 0.4; and (5) non-survivor at 2 years of age, 0. Life years gained per live birth and quality-adjusted life years gained per live birth were calculated by multiplying the survival rate and the quality-adjusted survival rate, respectively, by the life expectancy. A life expectancy of 70 years was assumed, except for multiple-severely disabled children, whose life expectancy was assumed to be 40 years; a discount rate of 5 percent was applied to life years gained. For each live born ELBW infant, the number of patient-days of assisted ventilation and of stay in the tertiary hospital were recorded. The dollar costs were determined by multiplying the

equivalent patient-days of assisted ventilation by the calculated cost to the community of one patient-day of assisted ventilation at \$1,140 (in 1987 Australian dollars). Researchers calculated cost-effectiveness and cost-utility analyses and performed sensitivity analyses to determine robustness. The overall cost-effectiveness in 1987 Australian dollars for ELBW infants during 1985-87 compared with 1979-80 was \$104,990 per additional survivor, or \$5,390 per additional life year gained. The costs per 2-year survivor in 1987 Australian dollars in 1985-87 and 1979-80, respectively, by birthweight range were \$131,690 and \$121,220 for 600-699 grams, \$113,080 and \$96,420 for 700-799 grams, \$75,280 and \$64,470 for 800-899 grams, \$62,460 and \$55,270 for 900-999 grams, and \$80,620 and \$68,600 for the overall total 500-999 grams. The overall cost-utility ratios in 1987 Australian dollars indicated that the cost per additional quality-adjusted survivor in 1985-87 was \$98,570 and the cost per additional quality-adjusted life year gained in 1985-87 was \$5,090. Cost-effectiveness improved with increased birthweight. If the quality of life of the survivors was considered, the economic outlook was more favorable. The cost per quality-adjusted life year in 1987 Australian dollars was \$5,090, approximately one-tenth of that obtained from the only previous full economic evaluation of neonatal intensive care. The authors suggest that although neonatal intensive care is expensive, it compares favorably with some other health care programs, particularly as the outcome for ELBW infants continues to improve.

017

Cost of Neonatal Care.**Form:** Journal article.**Author:** Malan, A.F.; Ryan, E.;

Van Der Elst, C.W.; Pelteret, R.

Source: *South African Medical Journal*.

82(6):417-419, December 1992.

Abstract: Researchers conducted a medical and financial assessment of the Neonatal Unit at Groote Schuur Hospital in Cape Town, South Africa. The study included 482 admissions over a 3-month period.

Researchers evaluated two aspects: (1) The level of care and length of hospital stay for infants, and (2) the cost of such care. Levels of care included intensive, high, low, or general care, and each infant was assigned to a level on a daily basis until discharged. Cost was determined in South African rands for the neonatal unit for November 1990 and included costs of personnel (R146,842), services (R56,004), consumable supplies (R8,841), overhead (R50,719), equipment (R35,576), and the mortgage on the building (R14,400). Using data for 1 month, researchers trebled the costs to cover the 3-month study period. Calculated at a rate of per patient per day (ppd), intensive care (3.5 percent of patient days) cost R530 ppd, high care (38.7 percent of patient days) cost R265 ppd, low care (55.6 percent of patient days) cost R88 ppd, and general care (2.2 percent of patient days) cost R88 ppd. The average was R172 ppd. Very low birthweight infants (under 1,500 grams) accounted for 58 percent of expenditures. Half of this amount was spent on infants weighing below 1,000 grams; the cost was R14,621 per survivor and R344 per quality-adjusted life-year. The cost declined progressively for infants of greater birthweight. There is a paucity of comparable local data, but researchers considered the cost of care at Groote Schuur Hospital to be reasonable. 4 tables, 8 references.

018

Impact of Surfactant Treatment on Cost of Neonatal Intensive Care: A Cost-Benefit Analysis.**Form:** Journal article.**Author:** Merritt, T.A.; Hallman, M.;

Vaucher, Y.; McFeeley, E.; Tubman, T.

Source: *Journal of Perinatology*.

10(4):416-419, December 1990.

Abstract: Exogenous surfactant treatment is often used to reduce morbidity and mortality among very low birthweight infants with respiratory distress syndrome (RDS) or those at high risk for bronchopulmonary dysplasia (BPD). One group of researchers analyzed the overall effectiveness of postnatal surfactant administration from multiple studies involving over 5,000 infants, and found that surfactant recipients had odds ratios of 0.61 and 0.55 respectively for reducing RDS severity and death before discharge. Surfactant treatment costs upwards of \$500 a dose and many infants require multiple doses for a treatment course. Surfactant use may reduce the costs of neonatal intensive care. For instance, a study showed that at any gestational age, infants requiring assisted ventilation had hospital charges that averaged nearly \$10,000 per infant more than those for nonventilated infants, and surfactant use can decrease the need for assisted ventilation. Surfactant use has been shown to reduce the prevalence of chronic lung disease in some studies but not in others. Hospital costs of treating chronic lung disease averaged \$125,688 per infant in one study, with additional outpatient costs for oxygen, medications, and clinic visits of \$8,250 per infant during the first year. Abundant evidence now supports the efficacy of surfactant treatment for infants manifesting the early stages of RDS with selective or the so-called rescue approach. Neonatologists should reserve this therapy for those under 30 weeks' gestation with indices of surfactant

deficiency, and treat only those infants above 30 weeks' gestation with clinical, biochemical, and radiographic evidence of moderately severe RDS. 34 references.

019

Review of the Economics of Care for Sick Newborn Infants.

Form: Journal article.

Author: Mugford, M.

Source: *Community Medicine*. 10(2):99-111, May 1988.

Abstract: A researcher reviews the economics of caring for very low birthweight (VLBW) infants (less than 1,500 grams) by outlining methodological issues and reviewing published studies under three headings: (1) The cost of hospital care, (2) hospital cost differences arising from specific interventions, and (3) costs and benefits of regional organization of care. Studies are summarized in chart form and include the following: The costs of hospital care for VLBW newborns; effects of selected interventions on neonatal hospital costs; measures of economic evaluation of neonatal intensive care, according to birthweight class (5 percent discount rate); and comparative cost-utility results for selected programs. The review affirms that caring for VLBW babies is costly and that costs (on average) increase with decreasing birthweight. Many studies also support the view that access to neonatal intensive care facilities improves survival chances. The evidence about impairment is less clear. The research reviewed further indicates that regional organization of neonatal intensive care with efficient referral and transport mechanisms is more cost-effective for health care providers than attempting to provide a full intensive care service at every hospital where births occur. For wealthier countries, neonatal intensive care could be seen as a rational decision, where

considerable resources are already committed to the health and well-being of all childbearing women and their babies. The cost per quality-adjusted life-year gained in 1983 currency for selected health care programs include (1) PKU screening, less than \$0; (2) postpartum anti-D, less than \$0; (3) antepartum anti-D, \$1,220; (4) coronary artery bypass surgery, \$4,200; (5) neonatal intensive care, \$4,500; (6) T4 screening, \$6,300; (7) treatment of severe hypertension, \$9,400; (8) treatment of mild hypertension, \$19,100; (9) estrogen therapy, \$27,000; (10) neonatal intensive care, \$31,800; (11) coronary artery bypass surgery for single vessel disease, \$36,000; (12) school tuberculin testing programs, \$43,700; (13) continuous ambulatory peritoneal dialysis, \$47,000; and (14) hospital hemodialysis, \$54,000. 5 tables, 47 references.

020

Cost Implications of Different Approaches to the Prevention of Respiratory Distress Syndrome.

Form: Journal article.

Author: Mugford, M.; Piercy, J.; Chalmers, I.

Source: *Archives of Disease in Childhood*. 66(7):757-764, July 1991.

Abstract: Because the incidence of both neonatal respiratory distress syndrome and neonatal mortality can be reduced by giving corticosteroids to women expected to deliver preterm and by giving surfactant to infants at high risk of developing hyaline membrane disease, British researchers have considered what effects the adoption of one or both of these preventive policies would have on the costs of neonatal care. They estimated the effects of treatment from overviews of the relevant controlled trials and estimated costs from observations of care at one neonatal unit. The cost of caring for the 70 infants of less

than 35 weeks' gestation was estimated to have been 269,085 pounds. The use of antenatal corticosteroids for women with gestations up to 35 weeks would have reduced the number of cases of respiratory distress syndrome by 28 percent, and the number of deaths by 22 percent. The researchers estimated that the costs of caring for the whole cohort of 70 infants would have been reduced from 269,085 pounds to 240,985 pounds, which means a reduction in the average cost per infant by 10 percent; the cost per survivor would have been reduced from 4,561 pounds to 3,927 pounds, a reduction of 14 percent. Results suggest that if either of these policies is adopted for all infants under 35 gestational weeks at a drug cost of 150 pounds or less per infant, the overall costs of care would be reduced by 1 to 10 percent. The cost per survivor would be reduced by as much as 16 percent even if the drug cost per infant was 550 pounds. If the policies were to be adopted only for infants under 31 gestational weeks, both policies would result in a cost reduction per survivor of 5 to 16 percent, although the increased survival resulting from the policies would lead to an increase in overall costs of 7 to 32 percent for infants of less than 31 gestational weeks. 4 tables, 4 figures, 32 references.

021

Costs and Outcomes in a Regional Neonatal Intensive Care Unit.

Form: Journal article.

Author: Newns, B.; Drummond, M.F.; Durbin, G.M.; Culley, P.

Source: *Archives of Disease in Childhood.* 59(11):1064-1067, November 1984.

Abstract: At the Birmingham Maternity Hospital in Great Britain, the mean cost of caring for surviving infants who require neonatal intensive care ranges from approximately 2500 pounds (for infants above

1500 grams birthweight), to 5500 pounds (for infants 1000 to 1499 grams birthweight), to 10,000 pounds (for infants less than 1000 grams birthweight). The mean cost of caring for non-survivors is 1000 pounds or less, with little difference between the birthweight groups. These figures are based on the lengths of stay in three treatment regimens: (1) Intensive care, (2) high dependency care, and (3) special care; the average daily costs of which are estimated to be 235 pounds, 122 pounds, and 43 pounds, respectively. The survival of very low birthweight infants (less than 1500 grams) at this hospital has improved from 42 percent to 73 percent since the introduction of regional funding for neonatal intensive care. This increase in survival has been brought about without undue disability in the survivors. 4 tables, 1 figure, 4 references.

022

Costs and Benefits of Neonatal Intensive Care.

Form: Journal article.

Author: Pharoah, P.O.; Stevenson, R.C.; Cooke, R.W.; Sandu, B.

Source: *Archives of Disease in Childhood.* 63(7):715-718, July 1988.

Abstract: Researchers in England present estimates of the cost of producing quality adjusted life years (QALYs) in a neonatal intensive care unit over a 3-year period during which there was a considerable change in clinical practice following the appointment of a consultant neonatologist. Researchers followed a cohort of 152 very low birthweight infants (weighing less than 1,500 grams) born from 1979-1981 in a geographically defined area and made a costing of the initial admission to the neonatal intensive care unit. Researchers examined the infants between ages 3 and 4 for disabilities and use of medical services. A 4-point scale measured the severity of each

child's disability. Adjusting for differences in quality of life, researchers made an estimation of the costs of education and full-time residential care over the children's projected life spans. Researchers calculated the cost per survivor for the years 1979, 1980, and 1981 to be 14,623 pounds, 23,161 pounds, and 20,574 pounds, respectively. Costs per QALY for the three years were 766 pounds, 1,366 pounds, and 1,152 pounds, respectively. Results indicated a progressively increasing proportion of infants survived in the 3 years of the cohort, and there was an increasing incidence of disability among the survivors. When researchers related costs to outcome up to the age of 4, the cost per QALY became progressively less over the 3-year study period. After the age of 4, the costs of special education and residential care dominated, and the cost trend reversed. 3 tables, 10 references.

023

Cost Effects of Surfactant Therapy for Neonatal Respiratory Distress Syndrome.

Form: Journal article.

Author: Phibbs, C.S.; Phibbs, R.H.; Wakeley, A.; Schlueter, M.A.; Sniderman, S.; Tooley, W.H.

Source: *Journal of Pediatrics*.
123(6):953-962, December 1993.

Abstract: Researchers examined the cost effects of a single dose (5ml/kg) of a protein-free synthetic surfactant, Exosurf, as therapy for neonatal respiratory distress syndrome (RDS). They conducted two nonblinded, randomized clinical trials, a prophylactic therapy trial and a rescue therapy trial, and compared the studies' short-term (until hospital discharge) costs of neonatal care and the in-hospital and first year mortality rates. They used regression analyses to estimate the effects of surfactant on total hospital cost, cost per

day, duration of stay, and mortality rate for both treatment nodes, controlling for the independent effects such as birthweight, gestational age, multiple birth, type of delivery, maternal glucocorticoid therapy, and discharge to another hospital for recovery care. Researchers conducted the prophylactic trial at the University of California at San Francisco (UCSF) medical center only; the rescue trial was conducted at UCSF and Mount Zion Hospital Medical Center, a tertiary community hospital. Infants in the prophylactic trial were not eligible for the rescue trial. The cost of the surfactant was \$450 per bottle in each trial. With a dose of 5 milligrams/kilogram of Exosurf, infants with birthweights greater than 1,600 grams required two bottles of surfactant. Infants were entered into studies from 1985 to 1989. To adjust for inflation, researchers used the actual annual changes in average charges at each hospital to convert each infant's hospital charges to equal those of the study hospitals during the 1989-1990 fiscal year. They used the Medicare ratio of costs to charges for each institution to adjust charges in order to obtain estimates of the actual cost of hospitalization for each infant. The prophylactic trial included 74 infants born at UCSF with birthweights between 700 and 1,350 grams, and gestational ages of less than 34 weeks. The infants were randomly assigned to surfactant treatment and control (no surfactant treatment) groups with stratification by sex and two birthweight categories (700 to 1,100 grams and 1,101 to 1,350 grams). All infants were given surfactant within 11 minutes after birth. Prophylaxis was administered immediately after birth to 36 infants. Infants were eligible for the rescue trial if they weighed more than 650 grams and had RDS severe enough to require assisted ventilation with a mean airway pressure of greater than or equal to 7 centimeters water and a fraction of inspired oxygen greater than or equal to 0.40 for those infants with birthweights less than or equal to

1,250 grams, or greater than or equal to 8 centimeters water and oxygen greater than or equal to 0.50, respectively for larger infants. Infants could be entered into the study at any time between 4 and 24 hours after birth (mean, 12 hours). The rescue trial included 104 infants randomly assigned to treatment or control groups, stratified by hospital and three birthweight categories: (1) 650 to 1,250 grams, (2) 1,251 to 1,750 grams, and (3) greater than 1,750 grams. All treated infants received a single dose of 5 milligrams/kilogram of Exosurf, administered into the trachea. Rescue therapy was administered to 53 infants with established respiratory distress syndrome and birthweights greater than 650 grams. For the prophylactic trial, hospital costs were larger for treated infants versus control subjects who weighed less than 1,100 grams and lower for treated infants versus control subjects who weighed more than 1,100 grams at birth. For the prophylactic sample, the in-hospital mortality rate was 13.9 percent for the treated population and 18.4 percent for the control; the mortality rate for the first year of life was 13.9 percent for the treated population and 21.1 percent for the control. Means (with standard deviation and median costs) per infant of hospital stay respectively, were \$40,525, (\$30,333 and \$31,143) for the treated and \$28,034 (\$22,884 and \$24,536) for the control. Means (with standard deviation and median costs) per day per infant respectively, were \$794 (\$311 and \$750) for the treated and \$972 (\$571 and \$738) for the control. Researchers compared durations of stay in study hospitals to stays at other hospitals. Mean durations of stay in the study hospitals and all hospitals in days per infant were for the treated infants, 51.9 days for study hospitals and 67.9 days for all hospitals; for the control infants, 37.9 days for study hospitals and 53.8 for all hospitals. Mean birthweight was 976 grams for the treated population and 1,008 grams for the control population. Costs to achieve survival per

infant for the rescue trial were \$47,061 for the treated population and \$35,510 for the control population. For the prophylactic trial, there was an average cost per life saved of \$71,500. For the rescue trial, the in-hospital mortality rate was 17 percent for the treated population and 29.4 percent for the control; the mortality rate for the first year of life was 17 percent for the treated population and 33.3 percent for the control. Mean (with standard deviation and median costs) per infant of hospital stay respectively, were \$49,909, (\$51,512 and \$32,302) for the treated and \$67,216 (\$89,040 and \$33,192) for the control. Mean (with standard deviation and median costs) per day per infant respectively, were \$1,368 (\$652 and \$1,292) for the treated and \$1,554 (\$1,131 and \$1,252) for the control. Mean durations of stay in the study hospitals and all hospitals in days per infant were for the treated infants, 43.2 days for study hospitals and 56.8 days for all hospitals; for the control infants, 52.4 days for study hospitals and 54.5 for all hospitals. Mean birthweight was 1,317 grams for the treated population and 1,332 grams for the control population. Costs to achieve survival per infant for the rescue trial were \$59,515 for the treated population and \$100,824 for the control population. For the rescue trial, there was a \$16,600 per infant reduction in average hospital costs, which was larger than the cost of the surfactant, yielding a probable net savings. Summary results indicate that single-dose rescue surfactant therapy is a cost-effective therapy that reduces mortality rates relative to other commonly used health care interventions. Single-dose prophylactic therapy for smaller infants (less than or equal to 1,350 grams) appeared to yield a reduction in mortality rate for a small additional cost.

024

Newborn Risk Factors and Costs of Neonatal Intensive Care.

Form: Journal article.

Author: Phibbs, C.S.; Williams, R.L.; Phibbs, R.H.

Source: *Pediatrics*. 68(3):313-321, September 1981.

Abstract: To understand the sources of the high costs of neonatal intensive care, researchers gathered financial and medical information on admissions to the intensive care nursery at the University of California San Francisco H.C. Moffitt Hospital between July 1976 and January 1979. Researchers excluded from analysis data on infants weighing less than 500 grams and those with unknown birthweights or incomplete records, resulting in data on 1,185 admissions. Researchers divided the patients into six mutually exclusive diagnostic categories based on the major type of medical problem present: (1) Primary medical, which included infants who required no surgery or only minor surgical procedures; (2) cardiac medical, which included infants with primary cardiac problems that required no surgery; (3) anomaly medical, which included infants who had major anomalies other than cardiac malformations and that required no surgery; (4) medical surgery, which included infants who required some medical and surgical management; (5) cardiac surgery, which included infants who required surgery for a cardiac lesion; and (6) anomaly surgery, which included infants who had major anomalies other than cardiac malformations and that required surgery. Three levels of care are provided, depending on the state of the patient: (1) Maximum care, which provides one nurse per patient; (2) intermediate care, which provides one nurse for every two or three patients; and (3) recovery care, which provides one nurse for every four patients. The daily hospital bill is

made up of a basic charge to which a surcharge is added depending on the level of care provided during the day and charges for nursing, house officers, monitoring equipment, laboratory and radiologic studies, medicines, inhalation therapy, and specialized facilities. Researchers combined total hospital and physician bills to estimate the cost of care for each subject. Although the average cost was \$8,069, the median total cost was only \$3,610. The average cost per day was \$545 and the median cost per day was \$346. Multiple regression analysis showed that a significant portion of the variation in individual costs was explained by three measures of risk: Low birthweight, surgical intervention, and assisted ventilation. There was a highly skewed distribution of costs. Nearly half of all admissions had none of the above risk factors, had an average cost of about \$2,000, and accounted for only 13 percent of the total costs for the whole sample. In contrast, less than 25 percent of the admissions had two or more of the risk factors, had an average cost of \$19,800, and accounted for nearly 60 percent of the total costs. The average cost to produce a survivor was \$9,089 for the entire sample but increased to \$31,621 for infants whose birthweights were under 1,000 grams. Models that predict costs and length of stay were developed on a basis of seven categories of risk (no risk factors, ventilation, medical surgery, anomaly surgery, cardiac surgery, 1,000-1,5000 grams, 501-1,000 grams, and 1,501-2,000 grams) to allow for differences in patient populations. 9 tables, 8 references.

025

Womb Rent.**Form:** Journal article.**Author:** Pomerance, J.J.; Schifrin, B.S.;

Meredith, J.I.

Source: *American Journal of Obstetrics and Gynecology*. 137(4):486-490, June 15, 1980.

Abstract: Researchers analyzed the relationship between gestational age at delivery and the cost of neonatal care for 137 infants ranging from 24 to 34 weeks' gestation born between 1973 and 1977. The infants were patients from Cedars-Sinai Medical Center (Los Angeles, California). The study defined costs as hospital charges actually collected, adjusted to 1977 rates, and weighted according to a smoothed survival curve. Researchers calculated percent survival for each gestational age from the smoothed survival curve and determined weighted costs according to a specific formula. Data analysis indicated the cost estimates varied according to gestational age and development of respiratory distress syndrome, and both in turn related to survival. The estimated cost per infant without regard to survival status was (1) \$7,000 per infant at 24 weeks' gestation (none of whom survived), (2) a bimodal peak cost of \$36,000 per infant at 26 and again at 29 weeks' gestation, and (3) \$9,000 per infant at 34 weeks' gestation. Between 29 and 34 weeks' gestation, the average cost of hospital care fell about \$5,400 per week or \$772 per day. At certain periods of gestation, safe postponement of delivery for even a few days may result in significant financial benefits. 6 figures, 1 table, 8 references.

026

Cost of Neonatal Care.**Form:** Journal article.**Author:** Ryan, S.; Sics, A.; Congdon, P.**Source:** *Archives of Disease in Childhood*. 63(3):303-306, March 1988.

Abstract: In 1985, researchers in England conducted a 6-month evaluation of the costs of a regional neonatal medical and surgical unit that opened in 1984. The study looked at (1) direct treatment costs, (2) patient treatment costs, and (3) general service costs. Direct treatment costs were the salaries for the medical, nursing, and other professional staff and the costs of supplies and equipment. Patient treatment costs included the costs of (1) drugs, (2) intravenous feeding solutions, (3) investigations by the pathology laboratories, (4) blood transfusions, (5) radiology, and (6) operating room time. The general service costs reflected the general operating costs of the hospital, such as payment to ancillary staff, services, power, heat, and lighting. Each patient day was allocated to one of three categories: Intensive care, special care (preterm babies awaiting discharge home), and surgical care. Nursing costs were allocated in proportion to rostered staffing in each category. The total cost for 6 months was 972,000 pounds over 4,349 inpatient days and 282 admissions. For medical cases, the mean daily cost for different infant weight groups ranged from 187 pounds to 274 pounds. The average daily cost for regional referral patients (258 pounds) was greater than for district patients (199 pounds), probably due to the greater number of very low birthweight babies among the regional admissions. The neonatal unit admitted 23 medical patients weighing less than 1,000 grams at birth. The total cost for nine of the infants who died was 30,991 pounds, which is about 3 percent of the unit's total budget. 6 tables, 5 references.

027

Cost of Neonatal Intensive Care for Very-Low-Birthweight Infants.

Form: Journal article.

Author: Sandhu, B.; Stevenson, R.C.; Cooke, R.W.; Pharoah, P.O.

Source: *Lancet.* 1(8481):600-603, March 1986.

Abstract: Researchers in England studied the relationship between birthweight and the cost of care, creating a detailed costing of the Mersey regional neonatal intensive care unit (NICU) for 1983 (at 1984 prices) for (1) intensive care, (2) special care, and (3) nursery care. The study included all infants who received treatment, some of whom received neither intensive nor special care. In the observed time frame, the NICU provided 7,193 days of inpatient care. Researchers divided the cost of care for each level by inpatient days to give an average day cost. Multiplying the day costs by the number of days that 182 very low birthweight (VLBW) infants spent at each care level rendered a patient-specific cost estimate for each infant. Researchers observed the medical and nursing time spent at each level. The estimate of cost of capital equipment included items donated by charities and took into account capital consumption and maintenance. Researchers estimated annual consumption of consumables from quantities of 55 items used in 1 week. They based the estimate of annual consumption of drugs and pharmaceuticals on a 6-week sample period. Researchers also determined the cost of diagnostic tests and overhead. Data analysis indicated costs per inpatient day were 297, 138, and 71 pounds for intensive, special, and nursery care, respectively. Regression of ungrouped patient-specific costs against birthweight indicated the explanatory power of birthweight was negligible. The average cost per VLBW infant was 4,490 pounds for a

survivor and 3,446 pounds for a nonsurvivor. 3 tables, 5 references.

028

What Price Prematurity?

Form: Journal article.

Author: Schwartz, R.M.

Source: *Family Planning Perspectives.* 21(4):170-174, July-August 1989.

Abstract: In 1985, researchers (1) focused on a sample of infants representing over one-third of all urban births in the United States during 1985, (2) quantified the cost of hospital care for low birthweight (LBW) infants, and (3) identified the magnitude of the immediate savings of in-hospital costs that could result from a small shift in the birthweight distribution. Researchers examined immediate in-hospital costs of 360 urban tertiary hospitals for 80,282 neonates, 11 percent of whom weighed less than 2,500 grams. The hospitals provided clinical and financial data on all neonates and their mothers. The analysis estimated the cost of risk screening and prenatal care for high risk mothers needed to improve the birthweight distribution. Data used in the analysis come from a stratified sample of 28 urban neonatal intensive care centers that participated in a national study on the impact of diagnosis related groups on perinatal regionalization. A cost analysis focusing on all infants who survived and went home from the hospitals revealed that those weighing from 500-2,500 grams represented only 9 percent of the neonatal patient load but cost \$911,223,389 to care for, or 57 percent of the total acute inpatient cost for all infants. Neonates in the 500-1,499 gram range accounted for 1.6 percent of the infants cared for and over 33 percent of related costs in the urban facilities. If only 20 percent of infants moved from one birthweight group to the next, the upward shift would result in an immediate

savings of \$70-\$95 million. Programmatic expenditures for prenatal care needed to cause the shift would be \$9-\$28 million less than the immediate savings. 5 tables, 18 references.

029

Medical Care Costs of High-Risk Infants After Neonatal Intensive Care: A Controlled Study.

Form: Journal article.

Author: Shankaran, S.; Cohen, S.N.; Linver, M.; Zonia, S.

Source: *Pediatrics*. 81(3):372-378, March 1988.

Abstract: Researchers at the Children's Hospital of Michigan Developmental Assessment Clinic examined the medical costs of high risk infants following discharge from a neonatal intensive care unit (NICU) until the children were 3 years old. The study looked at costs incurred for (1) primary health care, (2) subspecialty care, (3) diagnostic care, (4) therapeutic care, and (5) rehabilitation. Researchers compared costs with those of developmentally disabled infants institutionalized following NICU discharge during the same time period and with existing medical costs available from the U.S.

Department of Agriculture estimates of raising a child from birth to age 3. Researchers considered infants high risk if they had (1) low birthweight, (2) intracranial hemorrhage, (3) chronic lung disease, or (4) a disadvantaged social background. The parents of 60 infants agreed to participate in the study. There were 23 children who served as controls because the results of their neurologic and developmental evaluations were normal (group A). Group B consisted of 15 children with mild neurologic and/or developmental abnormalities, and group C consisted of 22 children with moderate to severe developmental disabilities. Researchers collected medical outpatient and inpatient cost

data and data on health insurance, public assistance, and parental employment. Infants received developmental assessments at term age and 3, 6, 12, 24, and 36 months postterm. Testing included a physical and neurologic exam, an interim medical history, and the Denver Developmental Screening Test. At 12 and 24 months researchers administered the Bayley Scales of Infant Development, and at 30 and 36 months researchers administered the McCarthy Scales of Children's Abilities. Of the 60 study children 34 were hospitalized for a total of 98 hospitalizations. In group A, 7 of the 23 infants were hospitalized once. Among the infants in group B, 9 of 15 were hospitalized; the range of hospitalizations was 1 to 4, resulting in 19 hospitalizations. In group C, 18 of 22 infants were hospitalized, and the number of hospitalizations per patient ranged from 1 to 13. The average cost of an inpatient day was \$428 for a child in group A, \$657 in group B, and \$641 in group C. Among the 34 hospitalized children the average cost of one inpatient day was \$635; the total cost of the 72 hospitalizations was \$336,654. Data analysis indicated that following NICU discharge, children with and without neurodevelopmental deficits had significantly higher medical costs than children who were not in the NICU. 5 tables, 16 references.

030

Cost of Surfactant Replacement Treatment for Severe Neonatal Respiratory Distress Syndrome: A Randomized Controlled Trial.

Form: Journal article.

Author: Tubman, T.; Halliday, H.L.; Normand, C.

Source: *British Medical Journal.*

301(6756):842-845, October 13, 1990.

Abstract: During 1985-1987, researchers in the neonatal unit of Belfast's Royal Maternity Hospital (Northern Ireland) conducted a retrospective, controlled survey to estimate the cost of treating infants with severe respiratory distress syndrome with natural porcine surfactant. The study included 33 preterm babies with severe respiratory distress syndrome who were part of a European multicenter trial; 19 infants received the surfactant replacement treatment and 14 matched infants served as controls. The treatment group received a dose of the surfactant intratracheally and then 2 minutes of manual ventilation. The control group received only manual ventilation for 2 minutes. Both groups received identical medical and nursing care before and after randomization except for the replacement treatment.

Researchers calculated the total cost of neonatal intensive care and special care using a detailed survey of the staffing, equipment, and facilities at the hospital. To calculate the cost per bed day, researchers gathered data on the number of infants treated, the length of stay, and the proportion of the total number of bed days spent at each level of care. Researchers calculated the cost associated with surfactant replacement treatment per extra survivor in the treatment group and the cost per quality-adjusted life year (QALY) for each surviving baby in the treatment group. A total of 15 of the 19 treated infants and 5 of the 14 control infants survived. The cost per additional survivor in the treatment group was 13,720

pounds, and the cost per QALY was 710 pounds. When the costs are weighed against the benefits of the baby's surviving with a low probability of neurological abnormality and the potential for a healthy, productive life span of up to 70 years, surfactant replacement treatment for severe respiratory distress syndrome is fairly inexpensive and cost effective. 3 tables, 20 references.

031

Cost-analysis of Neonatal Intensive and Special Care.

Form: Journal article.

Author: Tudehope, D.I.; Lee, W.; Harris, F.; Addison, C.

Source: *Australian Paediatrics Journal.* 25(2):61-65, April 1989.

Abstract: Australian researchers assessed the inhospital costs of neonatal intensive care in Mater Mothers' Hospital, Brisbane, Queensland, Australia. For the year 1985, investigators calculated fixed and variable costs for services and uses of an Intensive/Special Care Nursery and corrected these to 1987 Australian dollar equivalents. Yearly costs included (1) total charges for staff (A\$2,454,532); (2) total furnishings (A\$114,911); (3) equipment (A\$1,287,941); (4) council rates for electricity, water, maintenance, and telephones (A\$50,882); (5) stationary (A\$9,760); (6) costs of 330 disposable items (A\$1,359,811); (7) pathology (A\$535,020); (8) radiology (A\$126,183); (9) surgical procedures (A\$16,085); (10) neonatal transport (A\$16,122); (11) laundry (A\$44,720); (12) pharmacy (A\$392,118); and (13) instrument sterilization (A\$230,240). After analyzing the data, researchers estimated that to establish a new neonatal intensive care unit of 43 cots in an existing hospital with available floor space, including operating costs for 1 year, would cost \$6,408,000 in 1987

Australian dollars. Daily costs per baby for each level of care were A\$1,282 for ventilator care, A\$481 for intensive care, A\$293 for transitional care, and A\$287 for recovery care. The cost per survivor managed in the Intensive/Special Care Nursery in 1985 showed the expected inverse relationship to birthweight, being A\$2,400 for greater than 2,500 grams, A\$4,050 for 2,000-2,500 grams, A\$9,200 for 1,500-1,999 grams, A\$23,900 for 1,000-1,499 grams and A\$63,450 for less than 1,000 grams. Further analysis for extremely low birthweight infants managed in 1986 and 1987 demonstrated costs per survivor of A\$128,400 for infants less than 800 grams birthweight and A\$43,950 for those 800-999 grams. Researchers conclude that this methodology might serve as a basis for further accounting and cost-evaluation exercises. 1 figure, 7 tables, 20 references.

032

Cost-Benefit Analysis of Neonatal Intensive Care for Infants Weighing Less Than 1,000 Grams at Birth.

Form: Journal article.

Author: Walker, D.B.; Feldman, A.; Vohr, B.R.; Oh, W.

Source: *Pediatrics*. 74(1):20-25, July 1984.

Abstract: Researchers performed cost benefit analysis on the care of 247 infants weighing between 500 and 999 grams at birth, admitted to Women and Infants Hospital of Rhode Island between January 1977 and December 1981. The neonatal mortality was 68 percent. Eighty-seven percent of the survivors were evaluated neurodevelopmentally for 1 to 5 years; 74 percent were normal or minimally impaired; 10 percent were moderately impaired; and 16 percent were severely handicapped. Using these data in conjunction with cost information obtained from the hospital and therapeutic care facilities for

handicapped children, total lifetime costs for the care of these infants were estimated. In 1982 dollars, present values of costs ranged from \$362,992 per survivor for those weighing between 600 and 699 grams to \$40,647 per survivor for those weighing between 900 and 999 grams, resulting in an inverse correlation between cost per survivor and birthweight. Researchers estimated present values of expected lifetime earnings per survivor, with a range of zero earnings for infants between 500 and 699 grams, to \$77,084 for those with birthweight of 900 to 999 grams. The evaluators concluded that from the standpoint of cost benefit analysis as was used for this study population, neonatal intensive care may not be justifiable for infants weighing less than 900 grams at birth. 5 tables, 20 references.

033

Economic Analysis of Regionalized Neonatal Care for Very Low-Birth-Weight Infants in the State of Rhode Island.

Form: Journal article.

Author: Walker, D.B.; Vohr, B.R.; Oh, W.

Source: *Pediatrics*. 76(1):69-74, July 1985.

Abstract: Researchers conducted a cost benefit analysis to evaluate the economic outcome of regionalized neonatal care in Rhode Island, with specific reference to newborns weighing less than 1,500 grams at birth. Regionalization of neonatal care in the state began in 1974, with a single tertiary care center (the Women and Infants Hospital of Rhode Island (WIHRI)) and eight community hospitals offering primary neonatal care. The study analyzed two time periods: 1974-1975 (initiation of perinatal regionalization) and 1979-1980 (regionalization established). For the very low birthweight infants admitted to the WIHRI, researchers collected data about (1) mortality, (2) duration of hospitalization, (3) hospital charges, and (4) neuro-

developmental outcome observed during followup assessment of survivors. Researchers calculated hospital charges for all infants from hospital billing, converting them to April 1982 dollar values. The study analyzed the data in two birthweight categories (501-1,000 grams and 1,001-1,500 grams). Data analysis indicated that the neonatal mortality for infants weighing between 501 and 1,500 grams decreased significantly between the two time periods. Neurodevelopmental morbidity was unchanged. The costs per survivor were consistent over the time periods studied. The estimated benefits per survivor increased between the time periods (though it was not a statistically significant increase), and benefits outweighed costs in both study periods. When the data for the two weight categories were examined, it became apparent that the cost-benefit analysis was negative for infants weighing between 501 and 1,000 grams (a \$74,310 and a \$378,774 net economic loss from 1974 to 1975 and 1979 to 1980, respectively). The large portion of economic benefit, however, was observed in infants weighing between 1,001 and 1,500 grams (a \$1,269,281 and a \$3,705,988 net economic gain for 1974 to 1975 and 1979 to 1980, respectively). 2 figures, 5 tables, 19 references.

034

Medical Expenses of Neonatal Intensive Care for Very Low Birthweight Infants.

Form: Journal article.

Author: Yu, V.; Bajuk, B.

Source: *Australian Paediatrics Journal*.
17(3):183-185, September 1981.

Abstract: Researchers reviewed the medical expenses to parents of neonatal intensive care for their very low birthweight (VLBW) infants under the current medical benefits scheme in Australia. Investigators gathered data on the

in-hospital medical expenses for 90 VLBW infants weighing 1,500 grams or less at birth, whose parents had private health insurance; they also gathered data on all 375 VLBW infants born at this hospital in the 4-year period studied. Researchers reviewed each infant's financial account to determine total and average daily charges as well as charges from all hospital departments and specialists, hospital bed rates, neonatologist, pediatrician, surgeon, cardiologist, radiologist, and pathologist. Seventy-five (83 percent) of the 90 study population infants survived. Overall survival was 297 of 375 infants (79 percent). Median total and daily charges per survivor were \$5,883 and \$70, respectively. Median total and daily charges per nonsurvivor were \$1,113 and \$450, respectively. Medical expenses per VLBW survivor calculated for all 375 VLBW infants admitted for neonatal intensive care over the 4-year period were \$6,813. This ranged from \$10,000 per survivor for the 11 survivors in the 501 gram-750 gram birthweight group to \$5,363 per survivor for the 145 survivors in the 1,251 gram-1,500 gram birthweight group. As these charges were a small proportion of the resource costs in providing a neonatal intensive care service, society at large was bearing most of the cost. Researchers believe that with the present decline in neonatal mortality and morbidity in VLBW infants, the outcome of neonatal intensive care justifies the cost. 3 tables, 7 references.

Infant and Child Health

General Infant and Child Health

035

Cost-effectiveness Analysis of Oral Rehydration Therapy.

Form: Journal article.

Author: Anon.

Source: *Weekly Epidemiological Record.*
65(36):275-279, September 7, 1990.

Abstract: Researchers compared the cost effectiveness of diarrheal disease treatment for children under age 5 at the Queen Elizabeth II Hospital in Maseru, Lesotho (Africa), 1 year before establishment of an Oral Rehydration Therapy Unit (ORTU) and 1 year after its establishment (1985 and 1987, respectively). The study also examined the cost effectiveness of alternative options for extending the operation of the ORTU beyond its weekday schedule. Researchers estimated costs (both recurrent and capital) using the methods proposed by the CDD Program of the World Health Organization (WHO) with some adaptations to the Lesotho setting. The methods for estimating costs were not given in detail. The cost per outpatient with diarrhea declined from Maloti (M) 14.26 in 1985 to M 11.21 in 1987 (in 1987, M 2.4 equaled one United States dollar). In this 2-year period, the number of diarrhea-related hospital admissions decreased from 376 to 218, representing a savings of M 36,166. In 1985, 12 percent of those under age 5 seen at this hospital required hospitalization compared with only 6 percent in 1987. The overall cost of diarrhea treatment of children under age 5 at the hospital declined from 1.31 percent of the hospital's total budget in 1985 to 0.57 percent in 1987. When comparing the savings created by the decrease in hospital admissions with the initial cost of establishing the unit (M 8,000),

and an annual maintenance cost of M 2,270, there was a net gain of M 25,857. If the ORTU were kept open at all times rather than its current Monday-Friday hours, the savings of M 21,360 in reduced hospital admissions would be offset by staffing costs. The most cost-effective strategy would be to operate the ORTU 7 days a week during the high diarrhea season only. 4 figures, 1 table.

036

Efficacy of Early Newborn Discharge in a Middle-class Population.

Form: Journal article.

Author: Britton, H.L.; Britton, J.R.

Source: *American Journal of Diseases of Children.* 138(11):1041-1046, November 1984.

Abstract: From November 1981 through March 1982, researchers assessed the safety and cost benefit of early newborn discharge by determining the incidence, time of onset, and nature of problems requiring hospitalization that appeared in the first 2 weeks of life among 1,735 consecutively born term infants in Tucson (Arizona) Medical Center, a private metropolitan hospital. Researchers divided the infants into two groups: Those who required physician attention during the initial 6-hour transitional period and those who did not. During the transitional period, infants were observed and nursing staff notified the physicians about positive laboratory test results for hypoglycemia, polycythemia, or clinical problems such as (1) respiratory distress, (2) cyanosis, (3) heart rate irregularities, (4) apnea, (5) persistent temperature instability, (6) continuous lethargy, (7) abdominal

distention, (8) vomiting, (9) feeding intolerance, (10) jaundice, or (11) major congenital anomalies. Of 1,583 initially well infants, 11 (0.7 percent) had problems other than jaundice develop that required hospitalization in the first 3 days of life; infants with abnormal transition periods had a 28 percent chance of requiring hospitalization for problems other than jaundice. A total of 46 (30 percent) of the 152 infants with abnormal transitional periods required inpatient care after 6 hours of age; in 43 (28 percent) the problem necessitating hospitalization was a continuation of a transitional period abnormality. The cost-effectiveness of discharge at 6 hours of age was compared with that of a traditional 72-hour hospital stay for the 1,583 initially well infants. Cost-benefit analysis demonstrated that the total hospital and physician fees for a 72-hour hospitalization were \$404 per infant (\$348 hospital and \$56 physician). For a 6-hour stay the total figure per infant was \$164 (\$116 hospital and \$48 physician). If the 34 initially well infants in whom problems later developed had remained in the hospital from birth and been transferred to intermediate or intensive care nurseries when they became sick, they would have incurred an additional cost of \$1,103; however, the additional cost to readmit them if they had been discharged early would have been \$7,069. As a whole, early discharge of initially well infants with readmission of those who became ill within 72 hours would have saved an average of \$236 per infant. The babies in whom problems did occur before 72 hours of age primarily had jaundice, rarely an urgent problem, which occurs with equal frequency in the second 72 hours after birth among those who did and did not require physician attention in the first 6 hours after birth. Most illnesses requiring hospitalization in the first 3 days of life could have been safely detected during an outpatient visit; these findings, in addition to a cost-benefit estimate, suggest that early discharge of initially well

infants with careful followup may be an effective alternative to a traditional 3-day stay. 4 figures, 3 tables, 9 references.

037

Randomized Clinical Trial of Early Hospital Discharge and Home Follow-up of Very-Low-Birth-Weight Infants.

Form: Journal article.

Author: Brooten, D.; Kumar, S.; Brown, L.P.; Butts, P.; Finkler, S.A.; Bakewell-Sachs, S.; Gibbons, A.; Delivoria-Papadopoulos, M.

Source: *New England Journal of Medicine.* 315(15):934-939, October 1986.

Abstract: Researchers conducted a study to examine whether it was safe and economical to discharge very-low-birthweight infants (under 1,500 grams) early if they met certain conditions. The study involved randomly assigning infants from the Hospital of the University of Pennsylvania to one of two groups. The 40 infants in the control group went home according to routine nursery criteria, which included a weight of about 2,200 grams. The 39 infants in the early discharge group went home before they weighed 2,200 grams if they (1) were clinically well and able to feed by nipple every 4 hours, (2) were able to maintain their body temperature in an open crib, (3) had no evidence of serious apnea or bradycardia, (4) had a mother who demonstrated satisfactory caretaking skills, and (5) had an adequate physical home environment with facilities for care. Infants and families in the early discharge group received home followup care by a nurse. The home care included instruction, counseling, home visits, and daily on-call availability of a hospital-based nurse for 18 months. Results indicated infants in the early discharge group left the hospital a mean of 11 days earlier, weighed 200 grams less,

and were 2 weeks younger at discharge than the control group infants. The mean hospital charge for the early discharge group was 27 percent less than that for the control group, and the mean physician's charge was 22 percent less. The mean cost of the home followup care in the early discharge group was \$576, yielding a net savings of \$18,560 for each infant. The two groups did not differ in the number of rehospitalizations and acute care visits or in measures of physical and mental growth. 3 tables, 30 references.

038

Medical Care Use Among US Children.

Form: Journal article.

Author: Butler, J.A.; Winter, W.D.; Singer, J.D.; Wenger, M.

Source: *Pediatrics*. 76(4):495-507, October 1985.

Abstract: Researchers present and discuss some of the baseline data obtained on the subsample of all children ages 0-18 years from the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES). Collecting data on health insurance coverage and on financial aspects of contacts with health care providers, NMCUES involved interviewing members of 6,600 households five times between 1980 and 1981 regarding health care services; 5,662 people younger than age 19 completed the survey.

Researchers addressed four issues to determine whether the data reveal persistent gaps in access to care or use of services for certain groups of children and youth. Issue one concerned the proportion of subjects having a regular source of medical care, according to sociodemographic variables. Issue two involved how frequently the subjects saw a doctor and how this and the presence of a regular care source varied by poverty status, race, and ethnicity. Issue three addressed the

proportion of subjects covered by private or public health insurance and how the pattern varied according to family background characteristics. Issue four concerned the total 1980 medical care charges and charges paid out-of-pocket by parents for the total group and for various subgroups of subjects and how the charges vary by sociodemographic characteristics. Fifty percent of all children had \$99 or less spent on their medical care during the year. Researchers calculated costs for two model subgroups, those children covered for the full year by private medical insurance and those children covered by public medical insurance. Average total medical charges for the privately insured are \$339, compared with \$396 for the publicly insured. Out-of-pocket expenditure for the former group averaged \$104, compared with \$63 for the latter group. Analysis indicated that in 1980, 92 percent of American children and youth had a regular care source, and the same percentage had coverage for the full year or part of the year by some form of public or private health insurance. Approximately 75 percent of all children and youth had coverage for the full year and more than 75 percent had at least one medical care visit in the calendar year. Use rates and patterns of expenditure differed dramatically according to family background factors, particularly race, ethnicity, poverty status, and location of residence. Minority group and near-poor children were at highest risk for limited use of services and inadequate insurance coverage. Approximately 33 percent of African American and Hispanic children did not see a medical care provider during the year, compared with 21 percent of white children. Children living in central cities were less likely to have received any medical care than their counterparts living in suburban areas, smaller cities, or rural areas. Approximately 8 percent of infants and toddlers had no physician visits during the calendar year. 9 tables, 24 references.

039

Earlier Discharge With Community-Based Intervention for Low Birth Weight Infants: A Randomized Trial.

Form: Journal article.

Author: Casiro, O.G.; McKenzie, E.; McFadyen, L.; Shapiro, C.; Seshia, M.; MacDonald, N.; Moffatt, M.; Cheang, M.S.

Source: *Pediatrics*. 92(1):128-134,

July 1993.

Abstract: Researchers investigated the feasibility of earlier discharge of low birthweight infants with community-based followup of 100 infants with a birthweight of less than or equal to 2000 grams, without the use of home apnea monitors. Prolonged hospitalization of low birthweight infants appeared to increase the risk of medical and psychosocial complications. Subjects included 100 infants admitted to the neonatal units of either the Health Sciences Centre or St. Boniface General Hospital in Winnipeg, Manitoba, Canada between October 27, 1988 and June 30, 1990. Subjects were randomized to either an intervention (50 infants) or control group (50 infants) when they met five discharge-readiness criteria: (1) Clinically well, i.e., normal vital signs and in no distress while breathing room air; (2) free of apneic/bradycardic episodes, while not receiving apnea medications, during 3 consecutive days of continuous electronic monitoring and 2 days of observation; (3) able to maintain normal body temperature in an open crib; (4) able to feed satisfactorily by breast and/or bottle and requiring no supplementary gavage feedings; and (5) the safety of the home environment and the parents' readiness to care for the infant having been evaluated as adequate by the study public health nurse. The infant's physician, not the investigators, was responsible for deciding when an infant was to be discharged. The intervention used in this study was designed to

complement existing physician, hospital, and community followup programs. Thus, inhospital care to intervention group infants and their families did not differ from that for other infants. Community-based services were provided by a public health nurse and homemakers over the 8-week period following an infant's discharge from the hospital. The study assessed all infants at age 1 year using the Bayley and Home Observation for Measurement of the Environment (HOME) scales. There were no statistically significant group differences in baseline infants' characteristics or in neonatal complications. The minimum cost of care per patient per day was \$873 in 1990 Canadian dollars, which included hospital charges but not physician costs. Public health nursing services provided to the entire intervention group accounted for 50 hours predischarge, 300 hours postdischarge, and an estimated 150 hours for direct administration and travel time (500 hours multiplied by \$18.87 per hour in 1990 Canadian dollars) for a total cost \$9,435 or \$189 per infant. Indirect administration and system costs were not factored in. Homemaker services (at \$9.50 per hour in 1990 Canadian dollars) provided to the intervention group totaled 2,298 hours for the 8-week period for a total cost of \$21,831, or \$437 per infant. Infants in the intervention group were discharged from the hospital at a mean postconceptional age of 36.6 weeks; the mean age of the control group was 37.3 weeks. Infants in the intervention group were discharged from the hospital after a median of 23 days versus 31.5 days for the control infants. Among subjects with 1,501 to 2,000 grams birthweight, there was a statistically significant difference in (1) the median length of hospital stay, 17 days for the intervention group and 24 days for the control group; and (2) the mean discharge weight, 2,122 grams for the intervention group and 2,259 grams for the control group. During the first year of life, there were no significant differences

between the intervention and control groups in terms of rehospitalization rates and use of ambulatory care services. The public health nurse made a mean total of 185 home visits and 410 phone contacts to the intervention group families; 27 families (55 percent) in the intervention group required and received homemaker services. A total of 2,298 homemaker hours were provided. The public health nurse made a mean total of 66 home visits and 89 phone contacts to the control group. Intervention families had significantly higher 1-year HOME scores. The community-based program designed to provide individualized support and education for families of low birthweight infants was cost-effective and saved the equivalent of \$153,381 by shortening the hospital stay of the 29 infants of 1,501 to 2,000 gram birthweight in the intervention group by a average of 1 week. 5 tables, 38 references.

040

Costs and Benefits of a Community Special Care Baby Service.

Form: Journal article.

Author: Couriel, J.M.; Davies, P.

Source: *British Medical Journal*.

296(6628):1043-1046, April 1988.

Abstract: British researchers analyzed the activity of the Manchester Community Special Care Baby Service from January 1981-December 1986. Researchers collected prospective data weekly and included (1) the numbers and sources of all referrals, birthweight, and weight at discharge from hospital of all infants referred; (2) the number of visits made by the special care sisters; (3) the number of home assessments; and (4) the number of infants who required readmission to hospital while still under care of the service. The service works with (1) low birthweight babies, (2) babies discharged from the neonatal

surgical unit, (3) babies with problems on the postnatal wards, and (4) babies who lived in a special care nursing unit for more than 48 hours. The service consists of 10 specialist nursing sisters who are registered general nurses, state certified midwives, and certified neonatal nurses. The nurses work in three teams, with primary responsibility for a particular geographic region. They (1) attend neonatal ward rounds, (2) contact local clinics and physicians, (3) work with community midwives, (4) visit special care baby units, and (5) visit new mothers (at the hospital and at home). A total of 5,809 babies received referrals to the service over the 6 study years, about 14 percent of the live births in Manchester. Each referral resulted in an average of 11 visits. A total of 1,159 of the babies weighed under 2,000 grams, and 3,829 weighed under 2,500 grams. Over the 6 year period, 4 percent of all referrals were readmitted to hospital while under care of the service. Readmittance was related to birthweight: 19 percent of infants with a birthweight under 1,500 grams needed to be readmitted, compared to 3.3 percent of infants with a birthweight over 1,500 grams. Four infants died while under the care of the service between January 1985 and December 1986; all four infants had severe congenital or perinatal problems. The total annual cost for the service in 1985 was 126,638 pounds; the cost of each visit was approximately 11.18 pounds. With the improving survival rate for low birthweight infants and the growing recognition that they have an increased risk of dying or becoming seriously ill far beyond the neonatal period, the case for providing continuing support for the infants after they are discharged from the hospital has become clearer. A community specialist nursing service for low birthweight infants and infants at high risk allows more efficient use of overstretched hospital neonatal services and is highly cost effective. 3 tables, 20 references.

041

Cost Effectiveness of Home Management of Bronchopulmonary Dysplasia (Editorial Response).

Form: Journal article.

Author: Donn, S.

Source: *Pediatrics*. 70(2):330-331, August 1982.

Abstract: In a letter to the editor, a physician discusses the cost effectiveness of home management of bronchopulmonary dysplasia and documents the cost effectiveness of the Women's Hospital in Ann Arbor Michigan's program. Based on increasing numbers of infants requiring prolonged hospitalization for oxygen therapy for neonatal respiratory distress syndrome, he outlines the feasibility and efficacy of home management of infants using as examples the Women's Hospital program and studies by Pinney et al. (Home Management of Bronchopulmonary Dysplasia, *Pediatrics* 58:856, 1976); Philip et al. (Transcutaneous PO₂ Monitoring in the Home Management of Bronchopulmonary Dysplasia, *Pediatrics* 61:655, 1978); and Glassanos et al. (Infants Who Are Oxygen-dependent: Sending Them Home, *American Journal of Maternal and Child Nursing* 5:42, 1980). In the Women's Hospital program, through December 1981, 18 infants were sent home oxygen dependent. The first 12 infants no longer require supplemental oxygen and are symptom-free. The 12 infants ranged in birthweight from 900 to 4,040 grams; gestational age ranged from 27 to 43 weeks. Eleven initially had respiratory distress syndrome and one had meconium aspiration pneumonitis; all had clinical and radiographic evidence of bronchopulmonary dysplasia. The length of hospitalization varied from 49 to 255 days. At the time of discharge all infants were receiving oxygen by nasal cannula; none required continuous positive airway pressure. The duration of the home oxygen therapy

ranged from 2 months to 8 months. During the period of oxygen dependence all infants were seen weekly in the Neonatology Clinic and were seen approximately monthly by their primary physicians. Six infants had no rehospitalization. Four infants were readmitted for management of upper respiratory infections; one infant was readmitted for pneumonia; one infant was electively rehospitalized for an inguinal herniorraphy. The average daily inpatient charges were \$627, which included (1) hospitalization, \$493; (2) physician fees, \$93; (3) respiratory therapy, \$20; and (4) laboratory fees, \$21. The nursery utilizes a graduated system of daily hospital charges, and all infants had progressed to the minimum daily charge of \$493. The maximum daily outpatient charge including clinic visit (\$30/week) \$4.29, primary physician (\$30/month) \$1.00, oxygen therapy (\$250/month) \$8.33, and medications (\$30/month) \$1.00, totals \$14.62. The determination of the hospital patient days saved was based on the assumption that discharge from the hospital would have occurred at approximately the same time as the infant was weaned from oxygen. Thus, patient days saved reflect the time from early hospital discharge through discontinuance of oxygen at home. Any rehospitalization days were subtracted from this figure. For the 12 patients, total hospital days saved were 1,281; there were 91 rehospitalization days, giving a net savings of 1,190 patient days. The overall savings for the group is the product of patient days saved and daily cost differential (1,190 multiplied by \$612), which is a total cost of \$728,280 or \$60,690 per patient. All figures are savings based on charges; actual reimbursements from third party payers are generally 65 percent to 85 percent of the charges. Although the author supports home management, he emphasized that home management of oxygen-dependent infants entails additional risks, less intense

observation, equipment failure, and a greater potential for medication error. In addition to the increased responsibilities and demands, parents must be taught suctioning techniques, assessment of infant well-being, and cardiopulmonary resuscitation. 4 references.

042

Home Care Cost-effectiveness for Respiratory Technology-dependent Children.

Form: Journal article.

Author: Fields, A.I.; Rosenblatt, A.; Pollack, M.M.; Kaufman, J.

Source: *American Journal of Diseases of Children.* 145(7):729-733, July 1991.

Abstract: Researchers evaluated home care costs and cost effectiveness versus alternative institutional care for children who were respiratory technology-dependent, enrolled in Maryland's Model Home and Community-based Services Waiver Program, and who had been discharged from short-term or long-term care hospitals between April 1985 and June 1987. Data were collected by the Coordinating Center for Home and Community Care, a consortium of public and private institutions, agencies, and organizations that (1) provided case management for children with respiratory disabilities living at home or in alternate living facilities, (2) monitored the plan of care, and (3) determined the cost-effectiveness of the program for each participant. Data were available on 10 children, 6 of whom were dependent on mechanical ventilation and 4 of whom had tracheostomies and received oxygen. Researchers evaluated the cost effectiveness eligibility by comparing the projected costs of home care to the projected costs of an alternative setting. The study projected annual costs for each patient's care at home or in an alternative institutional setting from an

individualized care plan developed by a multidisciplinary team. Researchers calculated savings by the program for the first year as estimated alternative institutional expenses minus home care reimbursements. Data analysis indicated the annual home care costs were approximately \$109,836 for ventilator dependent children and \$63,650 for oxygen dependent children with tracheostomy, representing annual savings of \$79,000 per patient and \$83,000 per patient, respectively, using individualized home care plans. The largest portion of home care reimbursements was for nursing care. The full program has the potential for saving \$4 million per year. 1 figure, 4 tables, 12 references.

043

Quality of Outcome and Cost in an Obstetric and Neonatal Service.

Form: Journal article.

Author: Gunn, T.R.; Nightingale, A.; Cable, G.D.

Source: *New Zealand Medical Journal.* 102(864):136-140, March 22, 1989.

Abstract: Researchers reviewed the outcome and efficiency of the obstetric and neonatal service at St. Helen's Hospital, Auckland, New Zealand. The review of perinatal outcome encompassed calendar years 1981 through 1987 and included all births at the hospital. Hospital statistics were collected in a standard manner during this period. Researchers reviewed the records of morbidity and case review committee meetings, and obtained the number of full-time staff working in the hospital in all fields. Analysis showed that in the 7-year period there was a 33 percent fall in perinatal mortality rates (from slightly less than 14 per 1,000 births in 1981 to 5.88 per 1,000 births in 1987). The early neonatal death rate has fallen from approximately 5 per 1,000 births in 1981 to

1.12 per 1,000 in 1987. The average perinatal death rate for Maori infants was low, 4.81 per 1,000 compared to 7.43 per 1,000 for Europeans over this period. There was a 38 percent increase in births, to 3,597 a year, while the total hospital staffing rose only 9 percent. Thus the ratio of births to staff has increased from 12.35 in 1981 to 15.6 in 1987. The cost per infant delivered in constant dollars has fallen 18.7 percent in the same period to NZ\$2,432. The postnatal bed occupancy was 101 percent in 1987 and the average day stay fell to 5.7 days. An extra 61 full-time staff would be needed to reduce the workload to that of 1981; the staff is now unable to give each family the necessary focused, holistic care it needs. 2 figures, 3 tables, 10 references.

044

Cost-Effectiveness Analysis of Strategies to Reduce Infant Mortality.

Form: Journal article.

Author: Joyce, T.; Corman, H.; Grossman, M.

Source: *Medical Care*. 26(4):348-360, April 1988.

Abstract: Researchers compared the cost effectiveness of various health inputs and government programs in reducing race-specific neonatal mortality or death in the first 27 days of life (when approximately two-thirds of all infant deaths occur). The programs and inputs included (1) teenage family planning use; (2) the Special Supplemental Food Program for Women, Infants and Children (WIC); (3) use of community health centers and maternal and infant care projects; (4) abortion; (5) prenatal care; and (6) neonatal intensive care. Using an economic model of the family as the analytic framework, the study determined effectiveness via ordinary least squares analysis and 2-stage least squares analysis to

estimate infant health production functions across large counties in the United States in 1977. Estimates of costs came from a variety of published sources; one study estimated the cost of initial hospitalization in a neonatal intensive care unit to be \$13,616, assuming an average stay of 13 days. The results indicated that initiation of prenatal care in the first trimester was the most cost-effective means of reducing the neonatal mortality rate for African American and white infants. For those who initiated prenatal care in the second and third trimesters, researchers estimated that they must obtain an additional three and six physician visits, respectively, with the cost of each visit averaging \$176-187. With respect to African Americans, prenatal care ranked second to WIC in reducing race-specific neonatal mortality or death in the first 27 days of life when the lower-bound cost estimate is used and first when less conservative estimates are used. African American infants benefitted more per dollar of input use than white infants. Neonatal intensive care, although the most effective means of reducing neonatal mortality rates, was one of the least cost-effective strategies. The same pattern of cost-effectiveness existed with respect to low birthweight. 4 tables, 21 references.

045

Costs of Multiple Pregnancy.

Form: Journal article.

Author: Keith, L.G.; Papiernik, E.; Luke, B.

Source: *International Journal of Gynecology and Obstetrics*. 36(2):109-114, October 1991.

Abstract: Researchers review United States vital statistics to describe the increase in multiple births between 1977 and 1987. The epidemic of multiple pregnancy, which has an increased rate of preterm birth, is of concern because of the need to provide high quality intensive neonatal support to large numbers of

low-birthweight infants. The paper focuses on three issues related to multiple gestation: (1) The extent and nature of the explosive increase in numbers of twins and higher order multiple births, (2) the inevitability of preterm delivery in substantial numbers of mothers of multiples, and (3) the growing awareness of the true costs of such events and how the costs impact upon society. Between 1977 and 1987, twin and multiple births rose approximately 30 percent each. There was a 47 percent increase in multiple births among women over age 35. A possible explanation for the increase in multiple births related to changing patterns of childbearing: The highest rates of dizygotic twinning normally occur in adolescents (who experienced a 30 percent decline in multiple childbirth rates during the same period, possibly due to increased numbers of induced abortions) and women over age 35, the age group that is experiencing increased, delayed childbearing. Presently there is no published United States national data comparing multiples and singletons on a weight for gestational age basis; however, a higher proportion of twins are born at low birthweight compared to singletons. Multiples versus singleton infants have a relative risk of perinatal mortality of at least 4.25. According to a study conducted at Johns Hopkins Hospital in Baltimore, Maryland, the length of neonatal intensive care unit (NICU) stay among twins doubles for each 500 gram increment below birthweights of 2000 grams. Among survivors, the risk of moderate to severe handicap is vastly increased as birthweight decreases. Low-birthweight and length of NICU stay are intimately associated with risk of future handicap (and costs attendant to the condition). Potential solutions include (1) provision of adequate methods to diagnose multiple pregnancy and provide comprehensive prenatal care, (2) provision of nutritional evaluation and support in the pregravid and pregnant state, (3) elimination of inappropriate uses of fertility-enhancing agents

and assisted reproductive technologies that lead to iatrogenic multiple gestation, and (4) consideration of selective reduction in some cases of higher order multiple gestation. 4 figures, 4 tables, 14 references.

046

Outpatient Oral Rehydration in the United States.

Form: Journal article.

Author: Listernick, R.; Zieserl, E.; Davis, A.T.

Source: *American Journal of Diseases of Children.* 140(3):211-215, March 1986.

Abstract: To compare the safety, efficacy, and costs of oral versus intravenous rehydration, researchers enrolled in a prospective, randomized study 29 well-nourished infants between ages 3-24 months who had acute gastroenteritis and were dehydrated. The study assessed the use of a holding room in a hospital emergency room for the outpatient rehydration of dehydrated infants. Infants with fluid deficits of less than 100 mL/kg were placed in a holding room for 8-12 hours for observation and oral hydration with a solution containing sodium, potassium chloride, citrate, glucose, and fructose. Patients who failed to return to a normal state of hydration in 12 hours or who failed to achieve adequate oral intake due to vomiting or refusal to drink were admitted to the hospital for parenteral rehydration. Medical personnel successfully rehydrated 13 of 15 patients orally as outpatients; 2 patients who were subsequently discovered to have urinary tract infections required hospitalization due to persistent vomiting. Orally rehydrated outpatients spent a mean of 10.7 hours in the holding room, as compared with intravenously rehydrated inpatients, who were hospitalized for a mean of 103.2 hours. Outpatient oral rehydration therapy was significantly less

costly than inpatient intravenous therapy (\$272.78 versus \$2,299.50 per patient), and somewhat less costly than intravenous therapy in the holding area (\$379.20 per patient). Results indicate that oral rehydration is a safe and cost-effective way to treat dehydrated children in an outpatient setting in the United States. The use of a holding room for observation in the emergency room can markedly decrease health care costs and unnecessary hospitalizations. 1 figure, 6 tables, 23 references.

047

Sudden Infant Death.

Form: Journal article.

Author: Loshak, D.

Source: *Lancet.* 1(8428):591, March 9, 1985.

Abstract: This report is derived from a lecture at a symposium on cot deaths (crib deaths) at the London School of Hygiene and Tropical Medicine, and describes the benefits of medical intervention to prevent sudden infant death in terms of cost per quality-adjusted life-years (QALY). With preventable infant deaths in Britain at 3-4 per 1,000 live births out of a total of 10 deaths per 1,000 in 1985, the author estimates that intervention could reduce the death rate by between a quarter and a third, thus saving 600-1,000 infants a year. Medical intervention would consist of a system of scoring, applied at birth and at 1 month, which would identify the 10-15 percent of infants most at risk for unexpected death. These would receive six extra visits by health visitors to improve infant care and identify early symptoms of illness. The estimated total cost of a national prevention scheme would be between 5-7 million pounds sterling a year: 2 million pounds for a central coordination monitoring unit and 1.5 administrators per 5,000 live

births, plus 3-5 million pounds for health visitors' time, giving an assumed mean cost of 8,000 pounds per death avoided. If an ensuing lifespan of 70 years were assumed, the annual cost per QALY of a prevented infant death came to 114 pounds, compared with 750 pounds for a hip replacement, 5,000 pounds for a heart transplant, and 14,000 pounds for kidney dialysis in a hospital. This suggests that programs designed to identify the risk of unexpected infant death and prevent it by health-visitor intervention would be highly cost-beneficial compared with other interventions in the health services.

048

Costs Incurred by Parents of Very Low Birth Weight Infants After the Initial Neonatal Hospitalization.

Form: Journal article.

Author: McCormick, M.C.; Bernbaum, J.C.; Eisenberg, J.M.; Kustra, S.L.; Finnegan, E.

Source: *Pediatrics.* 88(3):533-541, September 1991.

Abstract: By comparing costs incurred in the first year of life by 32 very low birthweight (VLBW) infants with the costs incurred by 34 term infants, researchers assessed the economic impact of posthospitalization care of VLBW infants. The researchers obtained prospective data on the quarterly charges and expenditures for care of a cohort of VLBW survivors and for the term infants from Children's Hospital of Philadelphia from July 1983 to October 1984. Parents recorded medical expenditures for each month in a diary. Quarterly, the parents were telephoned by a research assistant who used a structured questionnaire to obtain expenditure data. The diary plus questionnaire technique was adapted from methods used in national medical expenditure surveys. Interviewers collected (1) sociodemographic characteristics, (2) direct

medical costs, (3) related nonmedical direct costs, (4) other costs, (5) social support data, and (6) family impact data. The mean differences between NICU graduates and the comparison groups were compared using analysis of variance. Discrimination between charges covered by insurance and out-of-pocket expenditures could not be made; total costs for hospital care were difficult to ascertain because parents were unable to separate the individual charges due to prolonged billing periods. Researchers estimated patient costs by approximating the daily hospital charges for three children to be \$1,500 per child, based on the average at Children's Hospital of Philadelphia. Diaries and quarterly interviews revealed that VLBW infants averaged \$10,139 per infant in direct medical charges compared with \$1,179 for the term infants; the differential in charges was greatest in the first three quarters (\$3,653, \$2,509, and \$2,426 compared to \$212, \$126, and \$54, respectively). By the fourth quarter the difference was \$415 to \$459, with the VLBW infants charges \$44 less than the term infants. Transportation costs for VLBW infants and term infants were \$180 per year and \$23 per year, respectively. In terms of nonmonetary costs, parents of the VLBW children experienced greater restrictions in social contacts, particularly in the first two quarters. 4 tables, 27 references.

049

Evaluation of Interventions to Reduce Racial Disparities in Infant Mortality: Case Studies of Selected Interventions.

Form: Book chapter.

Corporate Author: US Department of Health and Human Services.

Author: McManus, M.

Source: IN: *Report of the Secretary's Task Force on Black and Minority Health. Volume VI: Infant Mortality and Low Birthweight.* Washington, DC, US Department of Health and Human Services, pp. 159-181, January 1986.

Abstract: Evaluation of Interventions to Reduce Racial Disparities in Infant Mortality: Case Studies of Selected Interventions provides summaries of five demonstration projects designed to reduce low birthweight (LBW) and the infant mortality rate (IMR). The projects are (1) the California OB Access Project; (2) the New York Evaluation of the Cost Effectiveness of an Intensive Program of Prenatal Care; (3) the South Carolina High Risk Perinatal Program; (4) the Washington, D.C. Better Babies Project; and (5) the St. Paul, Minnesota Adolescent Pregnancy Prevention Services. These projects were selected because of their evaluation designs, their findings of effectiveness, and their focus on financing as well as the delivery of comprehensive services. The California project (1) increased access to perinatal care in underserved areas, (2) halved LBW in the study population compared to the control group, and (3) realized a cost savings of \$250 a month over Medi-Cal cases. The New York program expected to have cost data after November 1985. South Carolina's program had (1) half the rate of fetal and neonatal deaths in the study population when compared to the rate in the control group; (2) lesser rates of postneonatal mortality; (3) more prenatal care visits; and (4) its first significant infant

mortality decrease in 4 years (in 1982 it was 16.1; in 1983 it was 15.0). The District of Columbia's project expected to have findings available after November 30, 1986. The St. Paul program found (1) a 40 percent decline in the rate of teenage pregnancies in the school population and (2) that pregnant teenagers were more likely to seek prenatal care.

1 table.

050

Pediatric Patients, Race, and DRG Prospective Hospital Payment.

Form: Journal article.

Author: Munoz, E.; Barrios, E.; Johnson, H.; Goldstein, J.; Mulloy, K.; Chalfin, D.; Wise, L.

Source: *American Journal of Diseases of Children.* 143(5):612-616, May 1989.

Abstract: Researchers analyzed resource consumption for hospitalized minority pediatric patients treated at the Long Island (New York) Jewish Medical Center, an 805-bed academic medical center, using the diagnosis-related group (DRG) prospective hospital payment format by race. The study analyzed all 14,489 hospitalized pediatric admissions over a 3-year period at the center. Researchers analyzed six characteristics by race for white, African American, and Hispanic pediatric patients: (1) Mean age; (2) hospital length of stay; (3) total hospital cost; (4) number of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes; (5) number of ICD-9-CM procedure codes; and (6) total number of ICD-9-CM diagnosis and procedure codes. The study assessed (1) profit and loss under DRG all payer reimbursement, (2) the number and percentage of outlier payments (additional payment for very expensive patients) for each group, (3) diagnostic costs, (4) adjustment by DRG index, and (5) route of admission. Mean

hospital cost per patient (adjusted for DRG weight index) was significantly greater for African American (\$8408) and Hispanic children (\$8099) than for white children (\$6744). The mean hospital length of stay was also longer for African Americans (10.18 days) and Hispanics (9.55 days) than whites (7.75 days). Financial risk as measured by outliers and losses under DRG's was greater for African Americans and Hispanics than whites. African American and Hispanic patients had a higher proportion of emergency admissions to the hospital than whites, a greater severity of illness, and higher diagnostic costs for each episode of illness. Because minority patients are more likely to be admitted to the hospital through the Emergency Room than whites (generally a more expensive mode of admission than nonemergency admittance), minority patients may be a financially unattractive population under DRG's. The data suggest that African American and Hispanic pediatric patients have a greater hospital resource consumption than whites and may be vulnerable to decreased access to quality medical care under DRG prospective payment. 3 figures, 2 tables, 12 references.

051

Childhood Human Immunodeficiency Virus Infection: The Spectrum of Costs.

Form: Journal article.

Author: Parrott, R.H.

Source: *Journal of Acquired Immune Deficiency Syndromes.* 4(2):122-129, February 1991.

Abstract: A physician reviews projections of the prevalence, estimates of cost, and available resources to cope with human immunodeficiency virus (HIV) infection in infants, children, and adolescents, and discusses the politics of seeking support. The

prevalence and number of new cases of HIV infection in children depend on several factors, some of which change from time to time and place to place. In predicting incidence and prevalence, planners must consider whether (1) to base predictions only on reported cases; (2) to account for factors that vary geographically (e.g., amount of drug abuse, extent of HIV infection in male and female drug users, and extent of bisexual and heterosexual spread); and (3) to use perinatal serosurveillance, which can assist in prevalence estimates and incidence prediction. There has been considerable variation in prediction of HIV infection in children, partially because the pediatric surveillance definition of AIDS does not adequately reflect national morbidity and mortality due to HIV infection. No matter what method is used for estimates of future cases, it is important to fund resources to follow and test infants whose status is indeterminant in addition to infants who are determined to be infected with HIV. Since the infant's IgG antibody status reflects that of the mother, estimates of the extent of HIV infection, both in women and infants, can be made by performing anonymous HIV antibody testing on an aliquot of the blood of newborns routinely obtained for mandated metabolic screening. The observed prevalence rate can be adjusted by 30-50 percent (the estimated rate of vertical transmission of HIV to the infant) to estimate the ultimate infection rate among infants born to infected mothers. Far more than hospital services are important in an ideal HIV program in areas with moderate to high prevalence, but to date, there are few data available beyond hospital costs and charges. Most caregivers believe that HIV-infected children and adults are better served outside the hospital when they are not critically ill or when they are clearly dying. Though it is assumed that out-of-hospital costs are less, such costs have not been analyzed as thoroughly as hospital costs. There are many hidden costs of HIV infection, including

manpower costs, hospital costs, and lifetime costs. Future funding strategies should include further development of community services and lobbying for HIV-infected children and adolescents. 5 tables, 23 references.

052

Impact of Eligibility Criteria on Phototherapy Program Size and Cost.

Form: Journal article.

Author: Plastino, R.; Buchner, D.M.; Wagner, E.H.

Source: *Pediatrics*. 85(5):796-800, May 1990.

Abstract: Researchers analyzed the impact of eligibility criteria on phototherapy treatment, in particular for home phototherapy treatment, based on program size and cost. Subjects included 786 births from two hospitals of the Group Health Cooperative (GHC) of Puget Sound, Washington, a large health maintenance organization. Four sets of admission criteria for home phototherapy were compared from the following sources: (1) the American Academy of Pediatrics, (2) Group Health Cooperative, (3) Slater and Brewer, and (4) Eggert et al. Infants were placed in one of three groups: (1) Those infants with no indication for phototherapy by any set of criteria, (2) infants needing hospital-based phototherapy indicated by all sets of criteria, and (3) infants whose phototherapy treatment would differ depending upon eligibility criteria. Costs of phototherapy treatment were estimated for 86 infants whose treatment could vary by criteria set; 687 infants indicating no phototherapy and 13 infants treated in the hospital for all criteria sets were not included. Treatment varied substantially according to the criteria sets for the remaining 86 infants (10.9 percent). The treatment rates and home phototherapy rates of the 86 infants varied: (1) 51 infants (59 percent) under the American

Academy of Pediatrics with 23 for home treatment, (2) 12 infants (14 percent) under GHC criteria with 6 for home treatment, (3) 61 infants (71 percent) under Slater and Brewer with 18 for home treatment, and (4) 86 infants (100 percent) under Eggert et al. with 69 for home treatment. Only direct costs were assessed; indirect and intangible costs were excluded. Direct costs for one episode of home phototherapy was \$193 dollars and the direct cost of one episode of hospital phototherapy was \$423. Estimated annual discretionary phototherapy costs, including laboratory examination, home treatment, and hospital treatment ranged from (1) \$70,232 per infant under the American Academy of Pediatrics (\$55,064 greater than the GHC), (2) \$15,168 under GHC criteria, (3) \$90,800 under Slater and Brewer (\$75,632 greater than GHC) and (4) \$82,032 under Eggert et al (\$66,864 greater than GHC). Differences in costs were mainly due to the number of infants treated. Modest variations in standards of care can potentially have a large effect on medical care costs. The authors assert that although most cost savings occurred due to a reduction in the number of infants treated, health maintenance organizations reduce costs by substituting outpatient care for hospital care. 1 figure, 4 tables, 12 references, and appendix.

053

Home Oxygen Therapy in the Newborn: Costs and Parental Acceptance.

Form: Journal article.

Author: Thilo, E.H.; Comito, J.; McCulliss, D.

Source: *American Journal of Diseases of Children.* 141(7):766-768, July 1987.

Abstract: To assess the cost of and parental response to home oxygen therapy in newborn infants, researchers conducted a telephone survey of 34 families of infants discharged

from Rose Medical Center intensive care nursery (ICN) (Denver, Colorado) along with supplemental oxygen therapy. The telephone questionnaire assessed the social and economic impact of home oxygen therapy on the family. In all cases, the infants received oxygen via a nasal cannula with prongs. Criteria for discharge with supplemental oxygen were (1) stable respiratory status with low-flow oxygen for at least several days, (2) readiness for hospital discharge in all other aspects, and (3) willingness of parents and followup physicians to cope with oxygen therapy at home. Results of the questionnaire indicated the mean birthweight was 1,988 grams, with a mean gestational age of 33 weeks. The mean length of time infants needed oxygen at home was 74 days. The financial impact of home oxygen therapy was calculated for each infant by determining the cost of oxygen and related equipment and adding this figure to the cost of any special followup outpatient visits or laboratory tests, including outpatient oxygenation studies and blood gas determinations. Hospital costs were estimated using the minimal rate charged by the Rose Medical Center for an infant in the ICN receiving oxygen per day multiplied by the number of days receiving oxygen at home. In most instances, weaning of oxygen therapy was accomplished with the aid of periodic transcutaneous oxygen monitoring performed as an outpatient in the ICN. Savings for each infant of treatment at home compared with being hospitalized averaged \$33,370. Despite various problems and inconveniences (e.g., travel and babysitters), 94 percent of the families stated they definitely would again take a baby home while oxygen dependent if necessary. 7 references.

054

Higher Costs of Pediatric AIDS Care Documented.

Form: Journal article.

Author: Tokarski, C.

Source: *Modern Healthcare*. 20(16):18, April 23, 1990.

Abstract: A study based on information from 44 children's hospitals revealed that children with acquired immunodeficiency syndrome (AIDS) stay in the hospital longer, need more services, incur higher costs, and are associated with higher hospital costs than adult AIDS patients. The findings emphasize the need for more community-based AIDS care, early detection, and treatment programs to minimize costly hospital stays. Providing hospital care to children with AIDS cost more than \$37 million in 1987, according to the study by the National Association of Children's Hospitals and the National Association of Public Health and Hospital Institute. Medicaid paid for nearly half that amount (45 percent). Private insurance covered 39 percent, and the remaining 16 percent was either self-pay or uninsured. By contrast, 48 percent of all adult patients with AIDS were covered by private insurance, 34 percent by Medicaid, 13 percent were self-pay or uninsured, 3 percent were covered by Medicare, and prison systems paid 2 percent. Young AIDS patients also require more frequent and lengthier hospital stays than adult patients. Hospitals' average annual cost for pediatric AIDS patients totaled \$34,713, but only 78 percent of that amount was covered by revenue. The typical children's hospital lost revenue on an average of \$7,701 per patient each year, compared with a loss of \$1,472 for adult patients. These findings indicate that more government and private money needs to be directed to children's hospitals that treat a large number of pediatric AIDS patients. Costly hospital stays can be reduced by community programs that

coordinate outpatient services, provide social services (transportation, child care, housing), and use a case-management system to meet a range of medical and social-support needs. A 2-year-old program at a Michigan hospital that provides outpatient services to both HIV positive children and their mothers in the same place has reduced admission rates to the hospital, because barriers to receiving ongoing medical care have been removed. 1 table.

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Development of Performance and Cost Indicators for Preschool Immunisation.

Form: Journal article.

Author: Alberman, E.; Watson, E.; Mitchell, P.; Day, S.

Source: *Archives of Disease in Childhood.* 61(3):251-256, March 1986.

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Limits of Fetal Viability: Obstetric Considerations Regarding the Management and Delivery of the Extremely Premature Baby.

Form: Journal article.

Author: Amon, E.

Source: *Obstetrics and Gynecology Clinics of North America.* 15(2):321-338, June 1988.

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Economic Analysis of a Child Abuse and Neglect Treatment Program.

Form: Journal article.

Author: Armstrong, K.A.

Source: *Child Welfare League of America.* 62(1):3-13, January-February 1983.

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Child Health-care Financing and Competition.

Form: Journal article.

Author: Austin, G.

Source: *New England Journal of Medicine.* 311(17):1117-1119, October 25, 1984.

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Epidemiology of Disease Expenses: The Costs of Caring for Children With Cancer.

Form: Journal article.

Author: Bloom, B.S.; Knorr, R.S.; Evans, A.E.

Source: *Journal of the American Medical Association.* 253(16):2393-2397, April 26, 1985.

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Impact of Emergency Room Laboratory Studies on the Ultimate Triage and Disposition of the Injured Child.

Form: Journal article.

Author: Bryant, M.S.; Tepas, J.J.; Talbert, J.L.; Mollitt, D.L.

Source: *American Surgeon.* 54(4):209-211, April 1988.

R061

Decade of Medicaid in Perspective: What Have Been the Effects on Children?

Form: Journal article.

Author: Cartland, J.; McManus, M.A.; Flint, S.S.

Source: *Pediatrics.* 91(2):287-295, February 1993.

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Mothers' Satisfaction With the Cost of Children's Care: The Role of Practice Settings and Actual Expenses.

Form: Journal article.

Author: Dutton, D.; Gomby, D.; Meunier, B.

Source: *Social Science and Medicine.*
30(12):1297-1311, 1990.

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Evaluation of an Early Newborn Discharge Program.

Form: Journal article.

Author: Feldman, W.E.

Source: *HMO Practice.* 7(1):48-50, March 1993.

R064

Utilization of Child Health Clinics Following Introduction of a Copayment.

Form: Journal article.

Author: Fischer, P.J.; Strobino, D.M.; Pinckney, C.A.

Source: *American Journal of Public Health.*
74(12):1401-1403, December 1984.

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Costs of Nosocomial Infection in a Neonatal Unit.

Form: Journal article.

Author: Girard, R.; Fabry, J.; Meynet, R.; Lambert, D.C.; Sepetjan, M.

Source: *Journal of Hospital Infection.*
4(4):361-366, December 1983.

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Cost of School Dental Care: Some Thoughts on Economic Analysis.

Form: Journal article.

Author: Godfrey, A.I.

Source: *Australian Dental Journal.*
25(1):20-24, February 1980.

R067

Model for Cost-Effectiveness Analysis of Services for High-Risk Families and Infants.

Form: Journal article.

Author: Greenspan, N.T.

Source: *Clinical Infant Report.*
3:537-567, 1987.

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Rand Health Insurance Experiment for Children.

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Author: Haggerty, R.J.

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Urban Health Data: Spending on Child Health Services in New York City.

Form: Journal article.

Author: Haggerty, R.J.

Source: *Bulletin of the New York Academy of Medicine.* 70(1):95-98, Summer 1993.

R070**Evaluation of a One-year Swedish Neonatal Care Population.****Form:** Journal article.**Author:** Holmqvist, P.; Svenningsen, N.W.**Source:** *Journal of Perinatal Medicine.*

13(2):87-96, 1985.

R071**Treatment Program for Failure to Thrive: A Cost/Effectiveness Analysis.****Form:** Journal article.**Author:** Karniski, W.; Van Buren, L.; Cupoli, J.M.**Source:** *Child Abuse and Neglect.* 10(4):471-478, 1986.**R072****Importance of Type of Usual Source of Care for Children's Physician Access and Expenditures.****Form:** Journal article.**Author:** Kasper, J.D.**Source:** *Medical Care.* 25(5):386-398, May 1987.**R073****Effect of Cost-Sharing on the Use of Medical Services by Children: Interim Results From a Randomized Controlled Trial.****Form:** Journal article.**Author:** Leibowitz, A.; Manning, W.G.; Keeler, E.B.; Duan, N.; Lohr, K.N.; Newhouse, J.P.**Source:** *Pediatrics.* 75(5):942-951, May 1985.**R074****Health Care of Poverty and Nonpoverty Children in Iowa.****Form:** Journal article.**Author:** Levey, L.A.; MacDowell, N.M.;**Levey, S.****Source:** *American Journal of Public Health.* 76(8):1000-1003, August 1986.**R075****Parental Costs of Neonatal Visiting.****Form:** Journal article.**Author:** McLoughlin, A.; Hillier, V.F.; Robinson, M.J.**Source:** *Archives of Disease in Childhood.* 68(5, Spec. No.):597-599, May 1993.**R076****Routine Admission Urinalysis Examination in Pediatric Patients: A Poor Value.****Form:** Journal article.**Author:** Mitchell, N.; Stapleton, F.B.**Source:** *Pediatrics.* 86(3):345-349, September 1990.**R077****Neonatal Intensive Care: Cost-Benefit Analysis (Editorial).****Form:** Journal article.**Author:** Neuspiel, D.R.**Source:** *Pediatrics.* 75(4):798-799, April 1985.

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Form: Journal article.

Author: Newacheck, P.W.; Halfon, N.

Source: *Medical Care.* 24(12):1110-1117, December 1986.

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Form: Journal article.

Author: Parris, T.G.

Source: *Acta Paediatrica Sinica.*

29(Supplement B):56B-65B, December 1988.

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Lessons From Health Trends for Systems of Child Health Care.

Form: Journal article.

Author: Pless, I.B.

Source: *Clinical Pediatrics.* 32(10):586-590, October 1993.

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Healthy Children: An Assessment of Community-Based Primary Care Health Programs for Children and Their Impact on Access, Cost, and Quality.

Form: Journal article.

Author: Porter, P.J.; Butler, J.C.

Source: *Advances in Pediatrics.* 34:379-410, 1987.

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Effectiveness of Computer-Generated Appointment Reminders.

Form: Journal article.

Author: Quattlebaum, T.G.; Darden, P.M.; Sperry, J.B.

Source: *Pediatrics.* 88(4):801-805, October 1991.

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Early Discharge of Low Birthweight Infants as a Hospital Policy.

Form: Journal article.

Author: Schmidt, R.E.; Levine, D.H.

Source: *Journal of Perinatology.* 10(4):396-398, December 1990.

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Evaluation of Neonatal-Intensive-Care Programs.

Form: Journal article.

Author: Sinclair, J.C.; Torrance, G.W.; Boyle, M.H.; Horwood, S.P.; Saigal, S.; Sackett, D.L.

Source: *New England Journal of Medicine.* 305(9):489-494, August 27, 1981.

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Survey: Statewide Family Support Programs.

Form: Journal article.

Author: Slater, M.A.; Bates, M.; Eicher, L.; Wikler, L.

Source: *Applied Research in Mental Retardation.* 7(2):241-257, 1986.

R086

Consequences of Cost-Sharing for Children's Health.

Form: Journal article.

Author: Valdez, R.B.; Brook, R.H.; Rogers, W.H.; Ware, J.E.; Keeler, E.B.; Sherbourne, C.A.; Lohr, K.N.; Goldberg, G.A.; Camp, P.; Newhouse, J.P.
Source: *Pediatrics*. 75(5):952-961, May 1985.

R087

Health Insurance, Medical Care, and Children's Health.

Form: Journal article.

Author: Valdez, R.B.; Leibowitz, A.; Ware, J.E.; Duan, N.; Goldberg, G.A.; Keeler, E.B.; Lohr, K.N.; Manning, W.G.; Rogers, W.H.; Camp, P.; Sherbourne, C.A.; Brook, R.H.; Newhouse, J.P.
Source: *Pediatrics*. 77(1):124-128, January 1986.

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National Health Insurance and Child Health Care.

Form: Journal article.

Author: Wallace, H.M.
Source: *Journal of Public Health Policy*. 1(2):150-165, June 1980.

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Form: Journal article.

Author: Wolfe, B.L.
Source: *Medical Care*. 18(12):1196-1207, December 1980.

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Ontario Child Health Study: Patterns of Ambulatory Medical Care Utilization and Their Correlates.

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Author: Woodward, C.A.; Boyle, M.H.; Offord, D.R.; Cadman, D.T.; Links, P.S.; Munroe-Blum, H.; Byrne, C.; Thomas, H.
Source: *Pediatrics*. 82(3, Part 2):425-434, September 1988.

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State-Level Public Policy as a Predictor of Individual and Family Well-Being.

Form: Journal article.

Author: Zimmerman, S.L.
Source: *Women, Health, and Poverty*. 12(3-4):161-188, 1988.



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092

Benefit-Cost Analysis of Amniocentesis.

Form: Journal article.

Author: Andreano, R.L.; McCollum, D.W.

Source: *Social Biology*. 30(4):347-373, Winter 1983.

Abstract: Researchers conducted a cost-benefit analysis of amniocentesis in an effort to provide useful guidelines to policy makers. Amniotic fluid can be used to assess the developmental level of the fetus and indicate the presence of certain genetic characteristics or defects in certain metabolic processes. For congenital anomalies in general, the incidence rates initially decrease as the age of the mother increases, reaching a minimum in the 25-29 year age range, and then rapidly increasing as maternal age increases beyond 30. For the purposes of this study, researchers looked at amniocentesis in terms of the resources which will be saved by society as a result of the program. They defined as a benefit anything that comes under the heading of resources not consumed as a result of the prevention of certain births. Costs dealt with the amniocentesis program itself, i.e., costs emanating more or less directly from the program. Benefits determined by the researchers included (1) saved cost of institutional care for mentally retarded or developmentally disabled persons, (2) saved cost of hospital and medical care in cases of neural tube defects and other conditions, (3) saved cost of loss of parental income due to a retarded or disabled child, and (4) benefits from basic research and expanded knowledge due to further development of amniocentesis. Costs of an amniocentesis program include (1) publicity to make the program known, (2)

administration of the program, (3) genetic counseling, and (4) abortion and associated care costs in the case of a positive test.

Researchers determined that the total benefit of extending the program to all women at or beyond age 35 would be \$60 million, and the total cost would be \$31 million. The cost of institutional care for mentally or developmentally disabled persons ranges from \$12,775 to \$30,588 annually. The estimates for income of retarded workers ranged from \$5,891 for mild retardation to \$5,233 for moderate retardation. Researchers determined that cost of the amniocentesis procedure averaged about \$200, ranging from \$121 to \$400. Abortion procedures had an average cost of \$250-300. When considering amniocentesis procedures, there are several moral, ethical, and legal issues which must be considered in addition to cost-benefit analysis.

093

Prenatal Cytogenetic Diagnosis: Medical and Social Implications. Indications, Acceptance By Doctors and Patients, Impact and Cost: A 10-year Review.

Form: Journal article.

Author: Bell, J.A.; Pearn, J.H.

Source: *Medical Journal of Australia*. 143(2):76-79, July 22, 1985.

Abstract: Australian researchers review the medical and social implications, indications, and acceptance by physicians and patients of prenatal cytogenetic diagnosis (PCD) over a 10-year period. Apart from the legal and ethical questions, clinicians and cytogeneticists have been involved in two distinct debates: (1) Philosophical questions about what

constitutes high risk for a couple having a future child with a cytogenetic abnormality, and (2) pragmatic questions concerned with offering a diagnostic service to as many couples as the cytogenetic support services can cope with, without compromising standards. By 1975, amniocentesis for early PCD had become an established part of clinical genetic practice and antenatal care. The two most common indications have been maternal age and a previous child with Down's Syndrome. Other indications include a family history of Down's Syndrome or other chromosomal abnormality, repeated abortions, parental carrier of a balanced translocation, and maternal carrier of an X-linked disorder, in order to determine fetal sex. The Human Genetics Society of Australasia has a policy stating that facilities for PCD should be available in Australia for all women 37 years of age or older. An assessment of the impact of PCD on the birth incidence of major chromosomal abnormalities, particularly Down's Syndrome, indicates that the maximum reduction which might be achieved in current practice is 30 percent. In acceptance by doctors and patients, the overall interpretation of patient surveys indicated that range of acceptance of PCD is between 60 and 80 percent and that the attitudes of obstetricians towards PCD are a significant factor affecting the acceptance of this test as a routine procedure. Utilization rates of PCD vary among physicians due to knowledge difference, acceptance of innovation, perceived risks, and personal beliefs. In studies conducted between 1976 and 1982, utilization rates range from 6.7 percent (Adams et al., 1978, Nebraska, U.S.) to 72 percent (Mikkelsen et al., 1981-82, Copenhagen, Denmark). In 1973, it was estimated that the cost of screening (with subsequent followup procedures) was \$64 million, but that the cost of care for infants with serious chromosomal abnormalities would be in excess of \$2 billion (an estimate approximately 32 times the cost of

prevention). The estimated cost of PCD in 1973 was \$150 per test. In 1977, Hook and Chambers estimated the per capita cost of PCD to be \$400 and that a PCD program would not result in economic loss if the maternal age limit for inclusion was 32 years of age. A cost benefit analysis of 1981-82 prevention programs in British Columbia for both Down's Syndrome and neural tube defects concluded that prenatal screening for Down's Syndrome is cost-beneficial for women 34 years of age and older. If all women in the study were screened, the average cost (in 1982 Canadian dollars) of detecting a fetus with Down's Syndrome was \$570 Canadian dollars. Access to PCD has been determined by medical attitudes towards what constitutes high risk and by questions about the logistics of delivering a new diagnostic test to as many couples as costs will allow. The most common indication, advanced maternal age, has led to different access criteria in various parts of Australia. Factors such as socioeconomic status, education, and religion affect the acceptance of PCD from the point of view both of patients and of the doctors who care for them.

094

Screening for Neonatal Alloimmune Thrombocytopenia: An Economic Perspective.

Form: Journal article.

Author: Gafni, A.; Blanchette, V.S.

Source: *Current Studies in Hematology and Blood Transfusion.* (54):140-147, 1988.

Abstract: Neonatal alloimmune thrombocytopenia (NAITP) is the platelet counterpart of the red cell disorder hemolytic disease of the newborn. The incidence of this disorder in a Caucasian population is about 1 out of 2,000-3,000 live births. NAITP is potentially treatable; therefore, should a policy of screening for it be recommended for

pregnant women in Canada? Economic evaluation must be conducted to help in this type of decision making. The evaluation of a preventive measure is complicated, and includes considerations of population and frequency of the illness, size of risks (including those associated with the prevention measure), and time between adoption of a preventive measure and the payoff in health. Researchers conducted an economic analysis under favorable assumptions toward the screening program, and calculated that the costs resulting from a screening program of 100,000 Caucasian pregnant women would be \$1,036,000 (Canadian dollars) or \$745,920 (United States dollars). This made the cost per quality-adjusted life-year (QALY) U.S. \$16,736. This is then compared with other screening measures; for example, NAITP screening would be 10 times more expensive than Rh immunization prevention, 3 times more expensive than thyroid screening, but two and a half times less expensive than a school tuberculin testing program. The authors' main conclusion from this preliminary economic evaluation is that an NAITP screening program has the potential to compete with other programs for the limited resources available. No cost information is given for each of the measures. 2 tables, 14 references.

095

Costs and Benefits of Prenatal Screening for Cystic Fibrosis.

Form: Journal article.

Author: Garber, A.M.; Fenerty, J.P.

Source: *Medical Care.* 29(5):473-489, May 1991.

Abstract: Researchers examined the costs and benefits of prenatal screening for cystic fibrosis (CF) and selective abortion using two types of tests: (1) Those based on restriction fragment-length polymorphisms (RFLPs),

which can only be applied when genetic material is available from a CF-affected family member; and (2) those based on probes for the newly discovered CF gene, which can be applied in the general population. When either type is applied in families of CF-affected children, even an expensive test produces substantial net benefits. Existing direct gene probe tests are not sensitive, although eventually they may become less expensive and more accurate than tests based on RFLPs. Even if these tests become highly accurate, the financial benefits of population-wide screening for CF are likely to be small or negative, particularly if testing does not lead to increases in the number of normal children as it decreases the number of births of CF-affected children. Because few children born in families without a history of CF have the disease, tests that are not perfectly specific will produce a large number of false-positive results, leading to the abortion of many normal fetuses. 2 tables, 6 figures, 35 references.

096

Economic Appraisal of Screening for Down's Syndrome in Pregnancy Using Maternal Age and Serum Alpha Fetoprotein Concentration.

Form: Journal article.

Author: Gill, M.; Murday, V.; Slack, J.

Source: *Social Science and Medicine.*

24(9):725-731, 1987.

Abstract: Researchers calculated the direct and indirect costs and benefits of expanding the existing screening program for Down's Syndrome by using maternal age and serum alpha fetoprotein concentrations using a sample of Down's Syndrome pregnancies from the North East Thames Region of England in 1982. The North East Thames regional screening policy for Down's Syndrome is to offer amniocentesis to all women ages 38 or

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more at the expected date of delivery in whom the risk of delivering a baby with Down's Syndrome is at least 1 in 220. In 1982 through 1983, 64 Down's babies were born in the North East Thames Region. These babies were ascertained through the regional cytogenetic laboratories and hospital obstetricians and pediatricians. The costs of the existing and extended programs were calculated by adding the costs of (1) the amniocenteses, including repeats; (2) the cytogenetic laboratory costs; and (3) the hospital costs of termination. Estimated cost of detecting and terminating each fetus was 5,614 pounds. If the program had been extended to all the women whose risk was 1 in 220 or more, the total cost for detecting and terminating would have been 118,300 pounds at 1983 prices, or \$7,393 each. Estimated total costs of the existing program were 61,755 pounds. The benefits included in this analysis reside in the averted excess lifetime costs of Down's compared with non-Down's individuals. These are compared under the following categories: (1) Lost parental output, (2) affected individuals output, (3) consumption of goods and services, (4) use of health services, (5) education, and (6) fostering and adoption. The life time costs of a Down's birth are 156,660 (discounted at 5 percent) and 120,940 pounds. If each birth were replaced a year later by a normal child, the costs amount to 30,070 pounds and the excess costs for a child with Down's Syndrome are 126,590 pounds. The estimated return on the 1,000 pounds spent on the screening program ranges from 14,100 to 27,900 pounds for the existing program and 13,600 and 21,200 pounds for the proposed extended program. If the uptake of the proposed screening program is maximal, the replacement rate is zero and a discount rate of 5 percent is used, the benefit cost ratio is 23.6. If the uptake of the program is 50 percent, the replacement rate is 100 percent and a discount rate of 7 percent is used, the benefit cost ratio is 12.2. The extra workload

involved in the proposed extension of the program amounts to between one and two amniocenteses per week in each district, and the extra cytogenetic analyses. An increment of this size at district level makes it unlikely that unit costs will be increased. 3 figures, 5 tables, 12 references.

097

Studies of Various Aspects of Down Syndrome in Denmark, and Their Use as an Epidemiological Basis for a Cost Benefit Analysis of Genetic Amniocentesis.

Form: Journal article.

Author: Goldstein, H.

Source: *Danish Medical Bulletin*.

39(6):489-508, December 1992.

Abstract: A researcher performed a cost benefit analysis (CBA) of a program of prenatal diagnosis by amniocentesis, analyzing two alternatives: (1) The Danish society, which has a program that offers amniocentesis at no cost to all Danish pregnant women, compared to (2) a society without the same program. The investigator studied three groups of persons with Down's Syndrome (DS) representing three stages of life: (1) 16 people aged 3-7 (preschool group), (2) 43 people aged 14-20 (adolescent group), and (3) 38 people aged 40-50 (adult group). The researcher collected data on their living conditions and use of health and social services by interviewing the DS person's caretakers (such as parents, siblings, institution workers). The study showed that living conditions of persons with DS are different from those of the background population. These differences grow more marked with the age of the person and comprise places of residence, educational activities, and vocational activities. Additional public sector costs due to the handicap of the DS person are 133,919 Danish Kroner (DKK)/year (equal to \$13,549 United States

dollars) for children ages 3-7; 219,750 DKK/year (\$24,409) for DS adolescents; and 207,587 DKK/year (\$18,436) for DS adults ages 40-50. Results indicate that the tangible benefits exceed tangible costs for most calculations of this study, if all Danish women were to be offered amniocentesis. 7 tables, 125 references.

098

Cost-benefit Analysis of Prenatal Diagnosis by Amniocentesis in Denmark.

Form: Journal article.

Author: Goldstein, H.; Philip, J.

Source: *Clinical Genetics*. 37(4):241-263, April 1990.

Abstract: Researchers in Denmark performed a cost-benefit analysis of amniocentesis using both the excess-cost method and the replacement method and several replacement and discount rates. In Denmark, amniocentesis is offered at no cost to various groups of pregnant women at risk for genetic disorders of the fetus. The most important risk factor is being over age 35. The analysis is based on incidence and survival rates for Down's Syndrome (trisomy 21), Patau's syndrome (trisomy 13), and Edwards' syndrome (trisomy 18), and on incidence and survival rates of children with neural tube defects (NTD's). Researchers calculated prevalences of various chromosomal aberrations such as NTD's and abdominal wall defects (AWD's) on the basis of vital statistics of the birth cohort for Denmark in 1985, and adjusted financial figures to 1985 prices. The following are annual costs to maintain an adult with Down's Syndrome in Danish Kroner: (1) 298,958 in an institution, (2) 72,037 in a private home, and (3) 67,572 in a sheltered residence. If amniocentesis were offered to all pregnant women independent of age, with a supposed participation rate of 75 percent and if

only tangible costs and benefits were included, the analysis shows a benefit:cost ratio greater than 1.0 using discount rates of 4 percent and 7 percent (both for the excess-cost method and replacement method). Analysis shows a benefit:cost ratio less than 1.0 using 10 percent. The ratio is approximately 1.0, if pregnant women between ages 15-19 and 20-24 years are excluded, using the discount rate 10 percent. The ratios are independent of both methods of calculation and rate of replacement but clearly dependent on rate of discounting. Researchers also performed calculations for other participation rates. If intangible costs and benefits are included, the results are more uncertain because the evaluation of intangible costs and benefits may vary between individuals and countries. 1 figure, 17 tables, 30 references.

099

Can We Afford Screening for Neural Tube Defects? The South Wales Experience.

Form: Journal article.

Author: Hibbard, B.M.; Roberts, C.J.;

Elder, G.H.; Evans, K.T.; Laurence, K.M.

Source: *British Medical Journal*.

290(6464):293-295, January 26, 1985.

Abstract: Researchers estimated clinical and financial gains and losses accruing from five different options for screening for open neural tube defects (ONTD), based principally on results of detailed monitoring of inputs and outcomes and of process costs in the South Wales Anencephaly and Spina Bifida Study. Between April 1977 and August 1979, researchers obtained complete information for 15,687 pregnant women in Mid Glamorgan, a nonteaching health authority in Wales. The five screening options included (1) diagnostic ultrasound scanning and amniocentesis for all mothers with serum alpha fetoprotein concentration confirmed to be above 95

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percent after ultrasound estimation of gestational age and exclusion of multiple pregnancy; (2) as option one, but for mothers with a concentration above 97 percent; (3) as option two, but also with ultrasound and amniocentesis for pregnancies with close family history of ONTD irrespective of fetoprotein concentration; (4) as option two, but with routine ultrasound scanning at first hospital visit; and (5) ultrasound scanning, but with no measurement of serum alpha fetoprotein concentration, in all pregnancies eligible for screening together with amniocentesis in all pregnancies with a suspicion of ONTD on ultrasound scanning. Researchers calculated social gains and losses associated with each of the options based on assumptions primarily derived from the South Wales field study. Long term gains, expressed in avoidance of births or stillbirths of a child with an open neural tube defect, were (1) 342 avoided births per 100,000 births for option one; (2) 324 avoided births per 100,000 for option two; (3) 351 avoided births per 100,000 for option three; (4) 340 avoided births per 100,000 for option four; and (5) 376 avoided births per 100,000 for option five. Long term losses produced by death or morbidity of a normal fetus as a result of (1) amniocentesis were, per 100,000 children, 100 cases of death or morbidity of a normal fetus for option one, 60 for option two, 100 for option three, 60 for option four, and 20 for option five; (2) termination of a normal fetus due to diagnostic error were, per 100,000 children, 20 abortions of a normal fetus for option one, 20 for option two, 20 for option three, 20 for option four, and 20 for option five; and (3) incorrect reassurance after a false negative screening test and subsequent birth of an affected child were, per 100,000 children, 124 births of an affected child for option one, 144 for option two, 114 for option three, 126 for option four, and 86 for option five. Financial costs per 100,000 population, in 1981 prices, were 707,500 pounds for option one, 656,100 pounds for

option two, 696,200 pounds for option three, 735,600 pounds for option four, and 677,900 pounds for option five. Results show option five to be the most cost effective option. If the prevalence, including terminations, of ONTD's is between 1.25 and 5 per 1,000 births, the financial cost of avoiding the birth of a child with an open neural tube defect who would survive for more than 24 hours ranges from 9,400 pounds (option five at a prevalence of 5 per 1,000) to 53,600 pounds (option four at prevalence 1.25 per 1,000). Prevalence is the biggest determinant of cost. 4 tables, 13 references.

100

Economic Considerations in Technology Assessment: The Case of Genetic Disease.

Form: Journal article.

Author: Lairson, D.R.; Swint, J.M.

Source: *Health Policy*. 9(3):309-315, 1988.

Abstract: Researchers describe economic issues pertinent to health care technology assessment using allocation alternatives that confront decision makers in screening for intervention against genetic diseases. These economic issues include (1) the allocation of resources between health and other sectors of the economy and between alternative services within the health sectors, and (2) the costs of producing the services that are selected. The authors use allocative efficiency, production efficiency, and cost benefit analysis to evaluate efficiency. Both community and on-demand hospital screening programs for Tay Sachs disease, in combination with diagnostic and therapeutic abortion services for couples at risk, have positive economic consequences. The cost benefit ratios range from 3:1 to 10:1 for community screening efforts and 1.6:1 to 3.2:1 for on-demand hospital screening. Concerning intervention against Down's Syndrome, the primary economic issue is

whether or not to increase investment in fetal detection programs, which have been shown to be allocatively efficient. Empirical studies found that benefit-cost ratio for Down's Syndrome and other chromosomal trisomies was 2:1; a Centers for Disease Control (CDC) study found the benefit-cost ratio is 1.5:1 (for maternal age greater than or equal to 35). However, only 22 percent of Down's Syndrome births in the United States are to women over 34 years of age. Due to the lower risks of amniocentesis and probability of Down's Syndrome, studies suggest that an expansion of service to pregnant women 33 and 34 would be allocatively efficient. Tests for alpha-fetoprotein levels used to prenatally detect neural tube defects can be used with risk levels for all maternal ages to indicate probability of an affected fetus. Alpha-fetoprotein level tests increase the number of affected fetuses that can be prenatally detected by more than 50 percent. Results indicate that investments in screening programs for Tay Sachs disease and Down's Syndrome are allocatively efficient, also for interventions against neural tube defects; however, there are complex ethical issues involved. The authors concluded that as tests for genetic diseases become available, each will have to be evaluated on its own merits relative to alternative health sector investments.

101

Cost-effectiveness Ratio of Chorionic Villi Biopsy for the Prenatal Diagnosis of Chromosomal Aberrations as Compared With Amniocentesis.

Form: Journal article.

Author: Marchese, C.A.; Viora, E.; Campogrande, M.; Carbonara, A.O.

Source: *Ricerca in Clinica e In Laboratorio*. 16(4):533-538, October-December 1986.

Abstract: Researchers evaluated whether chorionic villi biopsy (CVB) for the prenatal diagnosis of chromosomal aberrations may be a cost-effective procedure as compared with second trimester amniocentesis. The total cost of amniocentesis was divided into three categories: (1) Cost before amniocentesis, 80,000 Italian lira, which included two obstetrical visits, genetic counseling, and one ultrasound; (2) cost of amniocentesis, 216,000 lira, which included obstetrician's fee, one ultrasound examination, amniocentesis kit, and laboratory material and time; and (3) a second trimester pregnancy termination, 858,000 lira, which included psychiatric counseling and 5 days of hospital stay. The estimated cost of CVB also was divided into three categories: (1) Cost before biopsy, 72,000 lira, which included one obstetrical visit, genetic counseling, and one ultrasound examination; (2) cost of biopsy, 163,000 lira, which included two obstetricians' fees, one ultrasound, CVB kit, and laboratory material and time; and (3) cost of a first trimester abortion, 170,000 lira, which included a 1-day hospital stay. Since the most frequent indication for the prenatal diagnosis of chromosomal aberrations is advanced maternal age, the study limited analysis to 100 women of advanced maternal age who were 10 weeks pregnant with a viable fetus. The cost of second trimester abortion includes the fee for the psychiatric counselling, which in Italy is necessary for allowing a second trimester

pregnancy termination. For CVB, researchers considered the cost of 100 procedures, plus the cost of 6 therapeutic abortions; for amniocentesis, they calculated the cost of 5 spontaneous abortions, 95 amniocenteses, and 2 therapeutic abortions. Total costs for amniocenteses for the entire subject group were 31,536,000 lira and for CVB were 24,520,000. The costs for CVB were 22 percent less than amniocentesis. In addition to its lower cost, if CVB is proven to be as safe and accurate as amniocentesis for the prenatal diagnosis of chromosomal aberrations, then it might become a first-choice test in pregnancies at risk because of advanced maternal age. CVB had a lower cost primarily due to the shorter time required by the laboratory to process the specimens. Using the direct method for the cytogenetic analysis of chorionic villi, it was possible to avoid the time-consuming tissue culture needed for amniotic fluid. 4 tables, 8 references.

102

Cost-benefit Analysis of a Population Screening Programme for Neural Tube Defects.

Form: Journal article.

Author: Sadovnick, A.D.; Baird, P.A.

Source: *Prenatal Diagnosis*. 3(2):117-126, April-June 1983.

Abstract: British Columbia has approximately 39,000 births annually and the incidence of neural tube defects (NTD's) is 1.55 per 1,000 births. Researchers performed a cost-benefit analysis to determine if a population screening program for NTD's would be cost effective for British Columbia. In calculating costs and obstetrical benefits of a screening program, incidence figures for all births (i.e., livebirths and stillbirths) are used as these are incurred regardless of the pregnancy outcome.

However, in calculating the benefits from a

screening program associated with the avoidance of the costs for lifetime care of affected persons, only livebirth incidence rates are used since the cost of lifetime care is not an issue if an infant is stillborn. While there are approximately 39,000 births annually in British Columbia, researchers estimate that 20 percent of pregnant women would either fail to seek medical attention early enough in the gestation to allow them to participate in a screening program for NTD's or else would refuse to participate for personal reasons. A screening program for NTD's has been found to be 100 percent and 75 percent effective for detecting anencephaly (AN) and spina bifida (SB) respectively. Therefore, by screening 30,950 pregnancies, it is expected that 21 AN fetuses and 20 SB fetuses would be detected. Costs of prenatal diagnosis, such as ultrasonography and removal of amniotic fluid, are covered by the British Columbia government through a provincial medical insurance program. The protocol screening for NTD's includes a maternal serum alphafetoprotein (MSAFP) analysis (\$21.50 1980 Canadian dollars plus a \$0.74 mailing cost per blood test), a second blood test for women with raised MSAFP levels, and counseling for women with two consecutively raised MSAFP levels. Counselors explain further diagnostic testing in the protocol, including ultrasound to detect AN fetuses and amniocentesis. The cost of a program administrator also needs to be calculated into the screening cost (approximately \$30,000 annual salary). Costs for NTD screening were calculated for two situations: (1) When chromosomal analysis is done on all amniotic fluid samples, and (2) when chromosomal analysis is not done on all amniotic fluid samples. Benefits from the avoidance of lifetime costs of caring for persons with SB are approximately \$83,000 per person. It costs approximately \$700 less to terminate a pregnancy after 16 weeks gestation than to continue delivery and the savings in delivery

costs is considered an obstetrical benefit of screening. The costs of a screening program for the entire cohort of 30,950 pregnant women would be \$871,800 if only amniotic alphafetoprotein (AFP) levels are measured. If fetal karyotyping is done in addition to the measurement of amniotic AFP levels, the cost would increase to \$964,000 for the cohort of 30,950 pregnant women. The benefits from a screening program for NTD would be \$1,537,000 for the cohort of 30,950 pregnant women. The cost benefit ratio is 1.8:1 for prescreening for NTD and 1.6:1 when karyotyping is also done. The results of a cost benefit analysis for a screening program for NTD's show that such a program would be cost-beneficial in British Columbia. Calculations were based on the assumption that 2.3 percent of the cohort would initially have elevated maternal serum AFP levels. This figure has been reported to be as high as 7.4 percent, but results from recalculation of the costs using this higher rate also show that such a program would be cost effective in British Columbia. 1 figure, 2 tables, 29 references.

103

Economic Assessment of Maternal Serum Screening for Down's Syndrome Using Human Chorionic Gonadotropin.

Form: Journal article.

Author: Seror, V.; Muller, F.; Moatti, J.P.; Gales, C.L.; Boue, A.

Source: *Prenatal Diagnosis*. 13(4):281-292, April 1993.

Abstract: The effectiveness and costs of prenatal screening programs for Down's Syndrome using maternal serum markers will vary significantly depending on the biological cut-off values chosen in order to select women, at each maternal age, who will be sent for amniocentesis. On the basis of the first French prospective study of human chorionic

gonadotropin (hCG) measurement in maternal serum, researchers show that the screening protocol currently used in France, where hCG cut-off values are defined in order to offer amniocentesis to women of all ages with a 1 percent fetal risk of Down's Syndrome, would detect approximately 64 percent of all cases of trisomy 21 at birth and would provide cost savings for the French health care and social security system. On the basis of a representative sample of 100,000 pregnant women, the total costs of screening would reach \$8,302,000 American dollars but would generate net potential savings of \$32,186,000 in terms of life-long costs of care for trisomic 21 children which would be avoided by termination of pregnancy following a positive diagnosis of Down's Syndrome. Data about the effectiveness of screening come from the database of the Biochemistry Laboratory of Ambroise Pare Hospital in Boulogne. Economic assessment of screening strategies is performed on the basis of 100,000 women getting access to hCG testing and under the following assumptions: (1) The age distribution is identical to that of the French general population of pregnant women; (2) all women with hCG values equal to or higher than the cut-off levels will agree to have an amniocentesis and will choose abortion in the case of a true-positive diagnosis; and (3) 15 percent of pregnancy terminations concern affected fetuses who would have died anyway before the end of pregnancy or at delivery, implying no further costs for society. The results are presented on the basis of a unit cost of \$14 American dollars (80 1980 French Francs) for hCG testing and \$700 American dollars (4,070 1980 French Francs) for amniocentesis. The estimated life-long costs of care for a trisomic 21 child were between \$320,000 and \$777,500 American dollars (1,900,000 and 4,400,000 French Francs). Extensive sensitivity analyses were performed in order to take into account the remaining uncertainties about these life-long costs.

Researchers conclude that it is the ethical and value-laden issues rather than economic and financial arguments that set limits to the utilization of screening for Down's Syndrome using maternal serum markers like hCG. 1 figure, 4 tables, 37 references.

104

Economic Appraisal of Alternative Pre-natal Screening Programmes for Down's Syndrome.

Form: Journal article.

Author: Shackley, P.; McGuire, A.; Boyd, P.A.; Fitchett, D.M.; Kay, J.; Roche, M.; Wood, P.

Source: *Journal of Public Health Medicine*. 15(2):175-184, June 1993.

Abstract: Researchers evaluated the cost-effectiveness of alternative screening programs for Down's Syndrome within the Oxford Regional Health Authority in the United Kingdom. The measure of outcome is the average cost per Down's Syndrome birth avoided. Researchers evaluated a serum screening program for women of all ages, which includes the triple test of alpha-fetoprotein (AFP), unconjugated estriol (UE3), and human chorionic gonadotrophin (HCG). All women with a positive serum test would be offered an amniocentesis. Researchers compared this screening option with a screening based on maternal age. Data were collected on the current screening program within the Oxford Regional Health Authority and compared with the estimated cost-effectiveness of the triple test. From 1989 to 1990, a 2-year period, there were 96 cases of Down's Syndrome from 72,233 live births, or an overall incidence of 1.33 per 1,000 live births. Of the 96 cases, 39 (40 percent) were to women over 35 years of age. Making the assumption that there were 35,000 pregnancies per year in the Oxford Region, with an

incidence of Down's Syndrome of 1.33 per 1,000 live births, therefore implying that there will be 48 Down's Syndrome births per year in the Region, researchers used the Oxford data to estimate the triple test based on a 66 percent sensitivity, a 4.6 percent false positive rate, and a 100 percent uptake of the triple test and amniocentesis. Researchers estimated that the triple test would detect 31.7 of 48 Down's Syndrome fetuses. Replacement of the current screening with the triple test, with a risk cut-off point for amniocentesis of 1 in 250, would result in 12.5 extra Down's Syndrome detections. Researchers assumed that in addition to the 36,500 patient samples, 7,300 standards and quality controls would also need to be sampled. The estimated cost of the triple test procedure was 13.63 pounds sterling per person. Estimating the cost of each amniocentesis at 250 pounds sterling and each termination of pregnancy at 450 pounds sterling, the total cost associated with the introduction of the baseline serum screening program was 938,885 pounds sterling, which would result in an average cost of 29,618 pounds sterling per Down's Syndrome birth avoided. Indirect costs, including (1) lost parental output, (2) consumption impacts, (3) education impacts, (4) additional National Health Service (NHS) costs, (5) capital impacts, (6) adoption and fostering costs, and (7) lost individual output, were adjusted to 1990 prices and added. Researchers estimated excess lifetime costs of an individual with Down's Syndrome amount to 100,500 pounds sterling discounted at 6 percent; 79,500 pounds sterling when Baird and Sadovnick's life tables are applied. When incorporated into the costs per Down's birth avoided, the excess lifetime cost is 49,882 pounds sterling, or a general resource saving of 49,882 per Down's birth avoided from the introduction of a serum screening program. Based on a sensitivity analysis of the screening program, researchers found that the cost-effectiveness of the triple test is sensitive to assumptions concerning the

costs and uptake of amniocentesis and detection rate. Unless the uptake of amniocentesis is very low, the triple test is a more cost-effective means of screening. 4 figures, 3 tables, 12 references, and an appendix.

105

Appraisal of a New Scheme for Prenatal Screening for Down's Syndrome.

Form: Journal article.

Author: Sheldon, T.A.; Simpson, J.

Source: *British Medical Journal.*

302(6785):1133-1136, May 11, 1991.

Abstract: British evaluators appraised the triple test which is a new method of prenatal screening for Down's Syndrome based on maternal serum concentrations of alpha fetoprotein, unconjugated oestriol, and human chorionic gonadotrophin combined with maternal age. They determined the cost effectiveness of this test relative to screening only by maternal age over a range of population detection rates. Costs per affected fetus detected served as the outcome measure. Results indicate that the triple test is more cost effective than maternal age screening for amniocentesis risk cut off points, resulting in a detection rate for Down's Syndrome of over 45 percent. A detection rate of 60 to 65 percent is most cost effective, that is, the cost per case detected is at its minimum (around 29,000 pounds), though screening with higher detection rates is still likely to be cost beneficial. The researchers concluded that prenatal screening for Down's Syndrome based on the triple test should replace screening based only on maternal age. Individual women's preferences should be elicited by the use of structured decision analysis in order to maximize utility and so increase the benefits of the screening program. 3 tables, 1 figure, 23 references.

106

Cost-Justification Analysis of Prenatal Maternal Serum Alpha-feto Protein Screening.

Form: Journal article.

Author: Taplin, S.H.; Thompson, R.S.; Conrad, D.A.

Source: *Medical Care.* 26(12):1185-1202, December 1988.

Abstract: Researchers examined whether systematic use of maternal serum alpha-feto protein (MSAFP) screening will result in a positive or negative net cost to an insurer. They used Group Health Cooperative (GHC) of Puget Sound, Seattle, Washington, a closed panel health maintenance organization as the setting for the MSAFP protocol. Using a decision analysis approach, the researchers used the MSAFP test to detect neural tube defects (NTD's) and Down's Syndrome, identifying the possible outcomes and their respective probabilities. The initial MSAFP screening was 16 to 18 weeks after the first day of the woman's last menstrual period. After the screening, the protocol included the following events as appropriate: (1) A repeat MSAFP, (2) an ultrasound, (3) a genetic amniocentesis, and (4) a termination of pregnancy. The sensitivity of MSAFP was between 75 and 90 percent depending on the multiple of the median chosen to establish an elevation and the specificity was between 95 and 99 percent. The proportion of the population requiring genetic amniocentesis varied from one to two percent. Studies indicated that between 21 and 33 percent of Down's Syndrome cases are found among screened women under 35 years of age; an additional 10 to 20 percent of all Down's Syndrome cases were found by amniocentesis among women over 35 years of age. Generally, after the initial screening, approximately eight percent of women will have had a low MSAFP value (less than 0.5

multiple of the median), whereas another five percent will have had a high value (greater than 2.5 multiple of the median). The recommendation was that women with an abnormal value obtain a repeat MSAFP. Researchers assumed that 4.8 percent of the screened population will obtain a repeat MSAFP because of a high value, whereas 5.2 percent will obtain one because of a low value. Approximately three percent of the screened population will obtain an ultrasound as a result of an elevated MSAFP, whereas five percent will obtain one because of a low value. One to two percent of screened women will need amniocentesis to evaluate their risk of having a child with a NTD, whereas two to five percent will need one to check for Down's Syndrome. The probabilities and costs (in 1987 dollars) of events were analyzed on a computer spreadsheet using a decision analytic approach. A GHC chart audit provided baseline estimates of the use of ultrasound and amniocentesis. The prenatal population was 4,000 and participation was 40 to 80 percent. The costs were \$8 to \$12 for MSAFP, \$100 for ultrasound, \$800 to \$1,000 for genetic amniocentesis, \$595 for second trimester abortion, \$400 for prenatal care, \$1,500 for delivery, and \$2,000 to \$3,000 for spontaneous abortion. The cost benefit analysis considered only direct medical care costs that would be experienced by the insurer. Costs included were those associated with having an MSAFP program in operation; benefits were defined as health care costs avoided. Avoided costs included the avoided delivery and prenatal costs subsequent to a pregnancy termination and medical care that would have occurred following a delivery. Lifetime medical costs at GHC alone were used in the analysis. Researchers used discount rates of 5 and 10 percent for the 10 year analysis, and 14 percent to obtain present value for total lifetime benefits. Total costs were \$322,762 for each individual with Down's Syndrome and \$137,923 for each

individual with open spina bifida. The analysis considered MSAFP screening for NTD's alone, and then was repeated to consider screening for both NTD's and Down's Syndrome. Fewer than 1 percent of the women had an MSAFP performed. Fifty-four percent of women obtained at least one ultrasound during their prenatal care and 8.4 percent had an amniocentesis. Among all prenatal patients, 6.7 percent had at least one ultrasound during the time when it might have been indicated by MSAFP; 13 percent had ultrasound done between 16 and 18 weeks. Genetic amniocentesis was obtained by 8.4 percent of the sample. It would cost an estimated \$823,292 to perform NTD screening in 3,200 women per year over 10 years (assuming 80 percent participation) with a resultant avoided cost of \$456,332. The current values of these costs and benefits would be \$636,211 and \$347,218 using a 5 percent discount rate. Testing for both NTD's and Down's Syndrome results in current values of \$1,475,635 and \$574,392, respectively for program and avoided costs over the 10-year period. Thus, the current value of the costs of screening exceeded the current value of the avoided costs of care. Using a 5 percent discount rate, the cost to the insurer of a screening program for NTD's alone over 10 years exceeded costs avoided by \$10 per person screened. Adding screening for Down's Syndrome using the same MSAFP test increased the net cost by \$22 to a total of \$32 per screenee. Subtracting the cost of the baseline use of ultrasound and amniocentesis reduced this net cost by \$1 per person for NTD screening alone, and by \$4 when screening for both NTD's and Down's Syndrome. The estimate of the cost to the insurer was sensitive to assumptions regarding costs of medical care avoided, the expense of the MSAFP, the proportion of screened women requiring a genetic amniocentesis, and the cost of that procedure. Results indicated that screening by MSAFP for NTD's and

Down's Syndrome will result in a net cost to the insurer within the 10-year screening period and even when a lifetime of avoided direct care costs were considered.

107

When Does Mass Screening for Open Neural Tube Defects in Low-risk Pregnancies Result in Cost Savings?

Form: Journal article.

Author: Tosi, L.L.; Detsky, A.S.; Roye, D.P.; Morden, M.L.

Source: *Canadian Medical Association Journal.* 136(3):255-265, February 1, 1987.

Abstract: Researchers estimated the cost savings that might be derived from a mass prenatal screening program aimed at detecting open neural tube defects (NTDs) in low-risk pregnancies. They determined whether the costs of instituting a screening program would be less than the savings that would result from aborting fetuses with NTDs detected in utero. The screening protocol model used decision analysis to compare the costs of the two strategies: (1) No screening, and (2) screening all women at low-risk between 16 and 18 weeks of gestation. The costs associated with the no-screening strategy arise from the cost of caring for children with NTDs, which include direct medical costs of hospital and outpatient services, physician services, rehabilitation services, medical appliances, and institutionalization. The average cost for the first 10 years of life for a child with spina bifida was estimated to be \$42,507, which does not include indirect costs (e.g., costs of special education and loss of income by parents) or intangible costs (e.g., parental anxiety, psychologic effects on siblings and the child's own psychologic problems). The cost of screening included physician visits, genetic counseling, second trimester abortion, delivery of an abnormal fetus, amniocentesis, and

ultrasound examination. Testing costs were \$7.50 per test for the maternal serum alpha-fetoprotein (MSAFP) test. Direct costs associated with the loss of a healthy fetus were \$3,000. Our baseline analysis showed that screening versus no screening could be expected to save approximately \$8 per pregnancy given a cost of \$7.50 for the MSAFP test and a cost of \$42,507 (for the first 10 years of life for a child with spina bifida). When a more comprehensive estimate including indirect and intangible costs for caring for such a child was used, the savings with the screening program were more substantial. The average direct medical costs per pregnancy for the entire cohort were \$20.28 when screening is done and \$28.31 when screening is not done. For the sensitivity analyses, the cost of amniocentesis and the ultrasound examination were increased to \$250 and \$150, respectively, which still results in a saving of about \$3.30 per pregnancy in direct medical costs. The sensitivity analyses showed that the savings were somewhat sensitive to the cost of the MSAFP test and highly sensitive to the specificity (but not the sensitivity) of the test. The test could cost as much as \$15 and still remain cost effective. Results indicated that a screening program for NTDs in low-risk pregnancies may result in substantial savings in direct health care costs if the screening protocol is followed rigorously and efficiently.

Birth Defects, Mental Retardation, and Chronic Conditions

Infant Screening

108

Costs and Benefits of Screening for Congenital Hypothyroidism in Wisconsin.

Form: Journal article.

Author: Barden, H.S.; Kessel, R.

Source: *Social Biology*. 31(3-4):185-200, Fall-Winter 1984.

Abstract: Researchers conducted a comprehensive benefit-cost analysis of the screening program to detect newborns with congenital hypothyroidism in Wisconsin. The Wisconsin Infant Health Screening Program for congenital hypothyroidism follows a two-tiered system of testing in which T4 (thyroxin) is the primary marker and TSH (thyroid stimulating hormone) is tested on those individuals with a low T4 value. The costs of the program to prevent the serious developmental abnormalities associated with congenital hypothyroidism included the cost of screening and detection, \$269,230, or a laboratory cost per sample (78,050 samples) of \$3.45. Screening and detection costs included the costs related to the collection of the blood specimen and the costs incurred for laboratory testing. The cost of collecting the blood specimen in the hospital was estimated to be \$4.60 per patient. This cost included expenses for drawing blood, administration costs, medical record costs, supplies, billing costs, and overhead. Because one collection procedure provided the blood specimens for four screening tests, the cost of the hypothyroid portion was \$1.15 per sample. When the initial tests for congenital hypothyroidism are positive, recall tests must be done to verify the initial finding. The recall rate in Wisconsin was estimated to be 2 percent; the cost of the recall was estimated to

add \$1.60 to the cost of each sample tested. The sum of the costs for collecting and testing, including recall tests, was the cost for processing each sample, which was estimated to be \$6.20 for the period July 1, 1981 through June 30, 1982. The incidence of congenital hypothyroidism in Wisconsin was 1:6,500 and the discounted cost of detecting each case of congenital hypothyroidism was \$40,300. Treatment costs of individuals with congenital hypothyroidism included charges for clinic visits, costs of periodic T4 and TSH testing, and costs of the medication for thyroid hormone replacement. Discounted treatment costs were estimated to be approximately \$3,230 over the lifetime of the individual and the combined costs of detection and treatment were \$43,530. The benefits that result from the detection and successful treatment of an individual with congenital hypothyroidism are represented by the total cost of the disease if left untreated. Total benefits included (1) institutional care, foster care, and adult residential care and services, \$73,310; (2) special education, \$24,730; (3) foregone maternal income, \$13,000; and (4) lost lifetime productivity, \$30,730. The total benefits were \$141,770. Net benefits for detecting and treating one individual with congenital hypothyroidism were approximately \$98,200 using the 7 percent rate of discount (\$141,770 minus 43,530). Net benefits for detecting the 13 individuals with congenital hypothyroidism in 1981-82 totaled \$1,277,000. In the case of congenital hypothyroidism, early detection before clinical manifestations of the disorder appear is essential to prevent the mental retardation that is commonly associated with this disorder. Future costs and benefits were determined using a 4 percent, 7 percent,

and 10 percent rate of discount. 1 figure, 10 tables, 36 references.

109

Costs and Benefits of Screening for PKU in Wisconsin.

Form: Journal article.

Author: Barden, H.S.; Kessel, R.; Schuett, V.E.

Source: *Social Biology*. 31(1-2):1-17, Spring-Summer 1984.

Abstract: Researchers conducted a comprehensive cost-benefit analysis of a screening program to detect newborns with phenylketonuria (PKU) in Wisconsin. Classic PKU is a genetic disorder which, if undetected and untreated during the first few weeks of life, generally results in mental retardation and a variety of other abnormal conditions. Researchers compared monetary costs of the detection and treatment program with the projected benefits (avoided costs) that result from the prevention of the mental retardation associated with the disorder. Investigators determined future costs and benefits using a 4 percent, 7 percent, and 10 percent rate of discount to achieve comparability between the present and future costs. The estimated costs of the State Laboratory of Hygiene for PKU testing for 1 year were \$104,740 for 78,050 samples. Actual costs of collecting a blood specimen for testing were estimated at \$4.60 per collection. Treatment costs for PKU for a 20-year period (discounted at 7 percent) were estimated at \$40,830. Net benefits (benefits minus costs) for detecting and treating one person with PKU were \$208,000 (\$292,000 minus \$84,000) using the 7 percent rate of discount. Net benefits for detecting four persons with PKU per year in Wisconsin totaled \$832,000, a large rate of return on a relatively small investment. 10 tables, 42 references.

110

Screening Infants for Hearing Loss: An Economic Evaluation.

Form: Journal article.

Author: Brown, J.

Source: *Journal of Epidemiology and Community Health*. 46(4):350-356, August 1992.

Abstract: Using data from a prospective cohort study of 1,990 children born between August 1985 and April 1986, researchers conducted an economic evaluation of the program implemented in an English district health authority for the screening of infants for hearing loss. Researchers used the methodology of decision analysis to model (1) the conventional screening policy, which was for a health visitor and colleague to screen at 8-9 months, and for each child to be seen again by a clinical medical officer at 10 months for a developmental assessment plus hearing screen if necessary; (2) screening to take place at 10 months only if concern is expressed (or if there is a clinical indication) at the developmental assessment (alternative screening policy); (3) issuing to the family a checklist of the general signs indicating that a baby is hearing normally; and (4) no screening. The study focused mainly on children screened before age 10 months. The costs of screening included (1) clinic costs, (2) salaries of test personnel, (3) average test duration, (4) parent's travel costs, (5) parent's travel time, (6) resource use, and (7) treatment cost. When necessary, screening is conducted in the family home; for this computation, clinic and parent travel costs were excluded but tester's travel was included. The annual expected cost per unit output was 20.57 pounds for the conventional screening policy, 11.13 pounds (in-clinic cost and 11.23 pounds in-home cost) for the screening to take place only if concern is expressed, and 11.27 pounds for the third option of no screening.

Introducing the check list is likely to raise the cost of the alternative screening policy by 52 pence per unit output, but the effects are uncertain. The results suggest that the alternative screening policy is more cost-effective than the conventional policy, but has little advantage over not screening at all. The effects of introducing a check list need further investigation. 2 figures, 7 tables, 21 references.

111

Economic Evaluation of Cost-Benefit Ratio of Neonatal Screening Procedure for Phenylketonuria and Hypothyroidism.

Form: Journal article.

Author: Dhondt, J.L.; Farriaux, J.P.; Sailly, J.C.; Lebrun, T.

Source: *Journal of Inherited Metabolic Disease.* 14(4):633-639, 1991.

Abstract: Researchers present an approach to the cost-benefit analysis of the French neonatal screening program, which aimed to prove an expected positive cost-benefit ratio and to serve as a model to develop an analytical framework that can be applied to new programs. Investigators established a comparison between the cost of identification and care of patients with phenylketonuria (PKU) and congenital hypothyroidism (CH) and the expenditure for the care of untreated retarded patients. This comparison was based on the activity of the Nord-Pas-de-Calais Regional Screening Center, a screening center that tests 80,000 newborns a year with a single laboratory, and of interviews with patients' families. To evaluate the cost-benefit ratio per detected case, researchers calculated screening costs on the basis of (1) the expenses of the screening center and other economic data obtained from the National Economic Statistical Agency, (2) analysis of 153 medical records (63 cases of PKU and 90 cases of CH)

to establish medical costs, and (3) interviews with 60 families (30 with infants with PKU and 30 with infants with CH) to evaluate additional costs. The analysis yields a cost-benefit ratio of 6.6 for PKU and 13.8 for CH prophylaxis. The difference between the two was expected because the incidence of CH is five times higher than PKU and the cost of its treatment is much lower (7.6 percent of the medical costs versus 40 percent). The cost of dietary foods for PKU patients is 4.5 million FF and the annual mean cost per PKU infant for this diet is estimated at 15,000 FF. In CH, improvement in the therapeutic results is believed to be obtained with a higher dosage of L-thyroxine for the early treatment and earlier followup. Mean age of infants at diagnosis was 26 days. Screening logistics can be accelerated by (1) taking blood earlier (on day 3 instead of day 5), (2) speeding up mail transport, and (3) modifying the working schedule in the laboratory. Benefits of PKU neonatal screening for (1) the child and family were 981,841 FF; (2) the National Social Security were 2,364,238 FF; and (3) state and other administrators were 326,441 FF. For CH, the benefits of neonatal screening for (1) the child and family were 731,073 FF; (2) the National Social Security were 1,727,119 FF; and (3) state and other administrators were 465,624 FF; and the costs were 274,268 FF; 92,537 FF; and 100,609 FF, respectively. 1 figure, 3 tables, 6 references.

112

Cost-benefit Evaluation of Systematic Radiological Diagnosis of Congenital Dislocated Hip.

Form: Journal article.

Author: Faure, C.; Schmit, P.; Salvat, D.

Source: *Pediatric Radiology*. 14(6):407-412, 1984.

Abstract: Researchers evaluated the cost-benefit ratio of radiological detection of congenital hip displacement at the age of 3-4 months, taking into account the socioeconomic cost and radiation risk. Investigators retrospectively studied 163 cases of dislocation of the hip that were treated in the orthopedic surgery department of a hospital in Paris, France. Researchers calculated for each patient the cost of the treatment in francs according to prices usually applied in April 1981 in university hospitals. Patients included (1) 39 infants between 0 and 31 days old (group one), (2) 31 infants between ages 2 and 3 months (group two), (3) 56 infants between ages 4 and 9 months (group three), (4) 20 children between ages 9 and 15 months (group four), and (5) 17 children over age 15 months (group five). Treatment for group one involved (1) treatment by abduction and radiological and clinical survey for 33 of the 39 infants and (2) several days of hospitalization for 6 infants, which radically affected treatment costs. Group one had an average of 5.23 pelvic radiographs and treatment costs averaged 5,142 FF (SD of 3,580). Treatment for group two included hospitalization of 13 of the 31 infants for an average of 11 days, and an average of 8 pelvic radiographs per infant; treatment costs averaged 14,613 FF (SD of 12,315). Treatment for group three involved hospitalization of 43 of the 56 infants for an average of 28 days and an average of 14.44 pelvic radiographs; treatment costs averaged 38,953 FF (SD of 24,790). Treatment for

group four included (1) an average hospitalization of 57 days, (2) traction in abduction for 40 days, (3) surgical operations in 14 out of 20 cases, and (4) an average of 20.57 pelvic radiographs; treatment costs averaged 84,230 FF (SD of 17,108). Treatment for group five involved (1) hospitalization for an average of 175 days, (2) 1 or more surgical operations for 16 of 17 children, and (3) an average of 17.8 pelvic radiographs; treatment costs averaged 149,100 FF (SD of 70,388). Assuming a frequency of this disorder of 1 percent of the total population, the average cost of treatment of one case detected by X-ray screening at the age of 3-4 months, including the price of X-ray examinations of 99 normal babies, is 23,374 FF. The cost-benefit ratio of radiologically detecting and treating congenital hip displacement at the age of 3-4 months, compared to detecting and treating the same problem at the age of walking (12-15 months) is 3.76. In countries where the frequency reaches two percent, the cost benefit ratio is 4.57. Results show that the irradiation of the patient is much smaller when the diagnosis is made earlier. Comparing the slight irradiation delivered to normal infants by mass screening to the heavy irradiation received by a few individuals whose treatment is started after 9 months, the calculated risk of leukemia or of genetic disorder for the whole population still favors a systematic X-ray film of the pelvis at age 3-4 months. However, if a mass radiological detection program during the fourth month of life is made obligatory, this would necessitate a serious effort to train all radiologists to obtain adequate films with the best radiation protection. 1 figure, 1 table, 25 references.

113

Screening for Congenital Dislocation of the Hip: An Economic Appraisal.

Form: Journal article.

Author: Fulton, M.J.; Barer, M.L.

Source: *Canadian Medical Association Journal.* 130(9):1149-1156, May 1, 1984.

Abstract: Researchers in British Columbia, Canada, performed a cost-effectiveness analysis that compared the direct costs of screening for congenital dislocation of the hip (CDH) with the treatment costs resulting from no screening. Comprehensive screening programs at selected hospitals formed the basis for determining screening program costs. Included in overall cost estimates were costs of screening, conservative followup treatment, surgery for missed cases, and direct costs to families. Costs associated with screening and subsequent conservative treatment for 6-15 positive cases of CDH per 1,000 infants were about \$6,000 (\$6,111 to \$7,225) less than the costs of either open or closed reduction of the hip for 1.5 infants with CDH per 1,000 infants not screened (\$15,267 and \$12,655, respectively). When researchers adjusted assumptions about screening costs, rates with which cases were missed, and hospital treatment costs, only the assumptions thought to be overly unfavorable to screening and overly optimistic for no screening brought the costs of no screening within the likely range of costs of screening. Results strongly suggest that screening for CDH is cost effective relative to no screening when dealing with large numbers of newborn infants and very low false-negative rates. As for cost-effectiveness of screening for CDH in British Columbia: If one assumes conservative savings of \$3,000 per 1,000 screened infants, screening the approximately 40,000 infants born annually in British Columbia would imply a savings of \$120,000 (in Canadian dollars) per year. 3 figures, 5 tables, 33 references.

114

Cost-Benefit Analysis of the Detection and Treatment of Phenylketonuria (PKU) in Newly-Born Babies, in Belgium.

Form: Journal article.

Author: Goss, S.

Source: *Cahiers Economiques de Bruxelles.* (99):459-468, 1983.

Abstract: Using a cost-benefit analysis, a researcher estimates whether or not the cost of detection and treatment of phenylketonuria (PKU) in newly-born babies in Belgium is justified. Since 1972, more than 100,000 newborns have been examined for PKU annually at a cost of approximately 8 million Belgian francs (BF). The researcher uses two discount rates: (1) 4.18 percent, derived from the average of the interest rates of four categories of private investment (housing, other investment, consumption on credit, and other consumption) weighted according to the fraction of the public investment that diverts funds from each of these four categories of private investment; and (2) 7 percent, to examine the sensitivity of the benefit and cost ratios. Data on PKU screening includes the annual number of examinations and cases detected and the cost of one year's PKU screening in the government-approved centers from 1978-1981. The social costs, with 4.18 and 7 percent discount rates respectively, include (1) screening, average cost per year was 7.7 million 1981 BF, with 10 PKU per year detected; (2) government contributions for the dietary supplements Lofenalac and Phenyldon, 9.5 and 7.2 million 1981 BF; and (3) parental contributions toward the 30-year phenylalanine diet and treatment, 8.6 and 9 million 1981 BF. Total social costs were 25.8 and 23.9 million 1981 BF. For the study, the researcher assumes that without detection and treatment, PKU children are raised at home for the first 5 years of life then placed in an institution for the rest of their lives, implying a

loss of 10 adult life-values. The total social benefits without detection and treatment, with 4.18 and 7 percent discount rates respectively, are 174.5 and 99.7 million 1981 BF, which included: (1) Upbringing at home, 6.6 and 6.3 million 1981 BF; (2) upbringing in an institution, 24.9 and 17 million 1981 BF; (3) supplementary allowance, 11.4 and 9 million 1981 BF; and (4) loss of life value of 76.1 and 47.8 million 1981 BF for men and 55.5 and 19.6 million 1981 BF for women. The total social benefits with detection and treatment were 18 and 13.8 million 1981 BF, which includes the expense of upbringing at home only. The benefit:cost ratios for one year of PKU screening of average adult life value are 6.1 and 3.6, with 4.18 and 7 percent discount rates respectively. Assuming that treated PKU children will have only half of the average adult life-values yields benefit:cost ratios of 3.5 and 2.2, respectively.

115

Pitfalls of Newborn Screening (With Special Attention to Hypothyroidism): When Will We Ever Learn?

Form: Journal article.

Author: Holtzman, N.A.

Source: *Birth Defects*. 19(5):111-120, 1983.

Abstract: A researcher assesses the costs and benefits of newborn screening, explores the possible pitfalls of such screening, and considers how they can be corrected. The results of the U.S. Collaborative Study of Children Treated for Phenylketonuria (PKU), which followed 132 infants discovered to have PKU by screening up to age 6, showed that the benefits of PKU screening can be documented. Although the mean IQ of these children is lower than that of their unaffected siblings, it is far higher than in untreated or late-treated children with the disorder. As a result of discoveries that followed this

screening, what appeared to be a simple, homogeneous disorder turned out to be a heterogeneous collection, requiring different treatments, and a revision of diagnostic criteria to avoid treating unnecessarily. The same kind of problems could have been anticipated for hypothyroid screening but have still not been resolved. Reliably performed neonatal screening for hypothyroidism will detect the vast majority of infants destined to become retarded because of the condition. However, even infants who are treated early may still have problems. It is possible that asymptomatic infants discovered by screening may be treated unnecessarily. Despite problems of neonatal screening, the benefits of such screening for PKU and hypothyroidism exceed the costs, but probably not by as much as some early studies suggested. Provided are estimated costs of detecting and treating the 4 PKU infants and 10 hypothyroid infants estimated to be born in Maryland in 1984: Costs (in 1981 dollars) would be \$514,250. The benefit (averted cost) of Maryland's Newborn Screening Program for PKU and Hypothyroidism would be, at a 6 percent discount rate, \$1,270,000 (\$630,000 at a 10 percent discount rate). Mechanisms for resolving screening-related problems through careful monitoring and long-term study are still not firmly established. 8 tables, 24 references.

116

Cost-Effectiveness of Screening and Cryotherapy for Threshold Retinopathy of Prematurity.

Form: Journal article.

Author: Javitt, J.; Dei Cas, R.; Chiang, Y.

Source: *Pediatrics*. 91(5):859-866, May 1993.

Abstract: Researchers examine whether surveillance of a population to detect

retinopathy of prematurity (ROP), a rare sight-threatening disease and leading cause of blindness among premature infants, can be cost-saving from a governmental perspective. The National Eye Institute-sponsored prospective, multicenter trial investigating the use of cryotherapy for treatment of ROP demonstrates a significant reduction in blindness and low vision for patients with sight-threatening (stage 3) ROP. Researchers developed a microsimulation model based on Monte Carlo techniques to determine the cost-effectiveness of cryotherapy for ROP. The model included events such as disease progression, screening, detection, treatment outcomes, and mortality. Mortality, failure to develop threshold disease, severe vision loss following treatment, and severe neurologic deficits were treated as terminal nodes of the model. Simulations were performed on an annual cohort of 28,321 premature infants divided into three subpopulations: Premature infants based on birthweights 500 through 749 grams, 750 through 999 grams, and 1,000 through 1,249 grams; and for three ophthalmoscopic screening strategies: Weekly, biweekly, and monthly starting 28 days after birth. For this model, the researchers assumed a sensitivity and specificity of 80 percent and 95 percent, respectively, based on data on screening for diabetic retinopathy. The model assumes that (1) of those progressing to threshold disease, 82.5 percent develop bilateral threshold disease; (2) cryotherapy applied as soon as threshold disease is noted; (3) 6.4 percent of treated eyes will require additional cryotherapy; (4) no mortality associated with cryotherapy; (5) both eyes are treated; (6) that the outcome in the second eye is biased 50 percent in the direction of the outcome of the first treated eye; (7) treatment assumed to be permanent; (8) compliance rate for followup care at 100 percent; (9) unfavorable functional visual outcome consistent with severe vision loss in both eyes; (10) benefit of treating subthreshold

retinopathy of prematurity not modeled; (11) benefit of treating other birthweights not modeled; (12) 27.5 percent of cryotherapy done under anesthesia; (13) cost of screening per patient is \$84 for the first in-hospital visit and \$68 subsequent visits; (14) cost of cryotherapy is \$831 per eye; and (15) cost of anesthesia is \$222 per service. Researchers also addressed the progression to threshold ROP; symmetry of progression; outcome following cryotherapy for threshold ROP; risk of developing severe neurologic disabilities; costs for screening and treatment; government budgetary costs of infancy-acquired blindness, such as federal insurance and entitlement programs; and blindness and quality of life. The annual government budgetary costs of blindness, including special education, SSDI and Medicare, SSI and Medicaid, and tax loss are \$7,497 per person for ages 3 through 5, \$7,088 for ages 6 through 20, \$12,975 for ages 21 to 64, and \$90 for ages 65 and over. Researchers estimate that an emotionally well-adjusted blind person would have a health state utility of 0.48, compared with utility of 1.00 for complete well-being. To account for the time value of money, researchers discounted benefits to the year of treatment for ROP at three percent, the average cost of long-term funds borrowed by the federal government. The simulation predicts that approximately 1,000 infants from all three birthweight groups will develop threshold ROP. Based on 1,000 cases per year of threshold ROP, a biweekly screening and cryotherapy program is predicted to save 321 infants from a lifetime of blindness, while a monthly screening and cryotherapy program can save 289, and a weekly program can save 344. The weekly program is estimated at \$28.1 million, the biweekly program is \$15.7 million, and the monthly program is \$9.7 million. Predicted annual savings for screening and treatment range from \$3.8 million to \$64.9 million per year, depending on the screening frequency, discount rate, and costs of blindness chosen.

Biweekly screening is associated with both increased financial and medical savings. With biweekly screening, an additional 29 children per year are saved from blindness with \$0.7 million in increased savings than the monthly screening. Governmental savings directly relate to the percentage of patients who have a nongovernmental source of payment for health care. If governmental sources paid for care for only those uninsured individuals, the biweekly screening strategy will be associated with an additional \$13.3 million governmental savings. If private insurance covers all screening and treatment costs, the additional cost savings to the government would be \$15.7 million. 6 figures, 6 tables, 33 references.

117

Epidemiological Assessment of Neonatal Screening for Dislocation of the Hip.

Form: Journal article.

Author: Leck, I.

Source: *Journal of the Royal College of Physicians of London.* 20(1):56-62, January 1986.

Abstract: A researcher attempts to assess the deficiencies of neonatal screening for dislocation of the hip (DH) by measuring it against the main criteria that any population-wide screening program should meet. These criteria are: That the disorder to be detected should be important and of known natural history and be best treated early; the screening test should be accurate and safe; the treatment should be effective and its indications agreed; and both test and treatment should be practicable and worth the cost. Each topic is examined epidemiologically. Regarding cost, estimates of the current financial costs of screening and splinting for neonatal instability and of surgical treatment for established DH in the United Kingdom are not readily available, but figures were published for British

Columbia in 1981-1982 that can be used for an approximate assessment of the relative health service costs of screening versus not screening. Per 100,000 persons, these costs were \$1,141,625 (Canadian dollars) to provide surgical treatment for an estimated 125 recipients if screening was omitted, versus \$1,106,790 (Canadian dollars) for screening 100,000 people, splinting 1,935, and surgically treating 65. Screening is marginally more economical. Four main problems emerge in the field of neonatal screening and treatment for hip joint instability as currently practiced: (1) False positives, (2) false negatives, (3) treatment policies, and (4) questions on outcome of early treatment. Further trials are needed to answer these questions, and these should be designed to enable the costs and benefits of current screening and treatment policies to be compared as comprehensively as possible. Whether screening is justified will remain an open question until this is done. 3 figures, 3 tables, 57 references.

118

Hearing Loss Screening in the Neonatal Intensive Care Unit: Auditory Brain Stem Response Versus Crib-O-Gram; A Cost-Effectiveness Analysis.

Form: Journal article.

Author: Prager, D.A.; Stone, D.A.; Rose, D.N.

Source: *Ear and Hearing.* 8(4):213-216, August 1987.

Abstract: Researchers used cost-effectiveness analysis to compare two strategies for screening for severe hearing loss in the neonatal intensive care unit (NICU): The auditory brain stem response (ABR) and the Crib-O-Gram (COG). COG is an automated extension of behavioral audiometry in which a motion sensitive device replaces the human observer in detecting infant movement in

response to sound stimuli. In the ABR test, an electrical waveform is registered from the brain stem after reception of an emitted click. Researchers studied hypothetical cohorts of infants using data derived from the literature on screening test characteristics. They included the costs of initial screening (\$20,000 for COG testing 1,000 infants (versus \$110,000 for ABR testing 1,000 infants)) and those of further diagnostic testing for infants who fail the screening test (\$149,649 for 299 infants). There were two outcome measures: The cost of correctly detecting a case of hearing loss and the number per 1,000 infants screened of infants with hearing loss not detected before the end of the critical period of language development. To estimate the prevalence of hearing loss among NICU infants, researchers defined hearing loss to be permanent, bilateral, and of sufficient severity to warrant amplification. The cost data are derived from third party and operating costs in a New York City hospital and from manufacturers' estimates of charges. Costs are stated in 1985 dollars. Results showed the ABR to be more cost effective than the COG because, although it cost more per test than COG (\$110 and \$20, respectively), it had higher sensitivity (100 percent and 75 percent, respectively) and specificity to detect hearing loss (86 percent and 71 percent, respectively). The cost of diagnostic testing for infants who fail the screening test is estimated at \$651 each. Using best-estimate assumptions, ABR cost \$10,610 for each correctly detected case of hearing loss while COG cost \$14,310 for each correctly detected case (due to the incidence of false positives and their followup diagnostic tests). Among every 1,000 NICU infants screened, ABR detected all cases of hearing loss, whereas COG failed to detect hearing-impairment in five infants. 2 tables, 27 references.

119

Cost-effectiveness of Neonatal Screening for Duchenne Muscular Dystrophy: How Does This Compare to Existing Neonatal Screening for Metabolic Disorders?**Form:** Journal article.**Author:** Rosenberg, T.; Jacobs, H.K.; Thompson, R.; Horne, J.M.**Source:** *Social Science and Medicine*. 37(4):541-547, 1993.

Abstract: Researchers in Canada examined the costs of screening a series of 18,152 newborn males for Duchenne muscular dystrophy (DMD), an X-linked genetic disorder. The final aim of neonatal screening for DMD is the avoidance of cases in subsequent pregnancies in the families identified. The Manitoba Pilot Project of Neonatal Screening for DMD has existed on a research basis since 1986. The neonatal segment involves mass screening of newborn males. A prenatal protocol also is offered to affected families during subsequent pregnancies. In 1986 and 1987, 18,152 newborn males were screened for DMD using a drop of blood taken from their heels. This sample was obtained at the same time, and on the same card, as for the other metabolic diseases routinely screened for in the newborn period. The bioluminescent test for creatine kinase (CK) on whole dried blood, as formulated by Scheurerbrandt et al. was performed on this sample. The cost of specimen collection was based on an estimated 15 minutes of nursing time, consumables, as well as mailing to the provincial laboratory. This total was then divided by the number of diseases screened for in this manner, and which share the same resources. A value of 1 dollar per test was obtained. The cost per CK test was calculated at \$2.36 by the laboratory scientist at the provincial laboratory. It included shared cost of the specimen card, clerical time, reagents, consumables,

equipment servicing, and time of a medical technologist. Unit costs for repeated tests were \$20 per test. Unit cost to confirm positive cases was \$590.50 per child. Average genetic diagnosis costs were \$250 per person or \$1,250 per family. Total cost for prenatal diagnosis and intervention was \$3,282. The proportional total number of cases that could be prevented by a screening program is 16.7 percent and the probability that a carrier will have an affected child is one in four. Total costs and incremental costs to avoid one case of DMD were estimated in Canadian dollars at \$172,000 and \$83,100; compliance with genetic advice was identified as a factor crucial for cost effectiveness. In Manitoba, Canada, the annual total and incremental costs amounted to \$59,500 and \$27,300, respectively. Costs of neonatal screening for DMD were compared with costs of neonatal screening for inborn metabolic disorders. The two programs were found to be similar in costs. 6 tables, 25 references.

120

Economic Evaluation of Neonatal Screening for Congenital Dislocation of the Hip.

Form: Journal article.

Author: Tredwell, S.J.

Source: *Journal of Pediatric Orthopaedics*. 10(3):327-330, May-June 1990.

Abstract: Researchers conducted a study to determine the cost benefit of neonatal screening for dislocatable and subluxable hips at two hospitals in Vancouver, British Columbia, Canada (Grace Hospital and Children's Hospital). As a followup to retrospective and prospective studies that established the safety and efficacy of early treatment to the newborn, researchers examined the direct and significant economic benefit to the participating institutions of a neonatal hip screening program. Researchers

hypothesized that early treatment of the condition, which worsens and becomes harder to treat as the child develops, would lead to indirect cost savings to the hospital. Medical costs were based on the salary scales and fee schedules existing in British Columbia in 1987 and 1988. Investigators assumed a constant rate of 30 minutes for the screening process, performed three times weekly. Orthopedic surgeons were assisted by one registered nurse during the process. No charge was levied on behalf of the orthopedic surgeon for the procedure. Researchers used 1.5/1,000 live births as the incidence of congenital dislocation in the unscreened population, and used an incidence rate of 10/1,000 live births in the screened population. The cost of neonatal screening per thousand live births was C\$468. The hospitals experienced an economic benefit of C\$15,143.71 per 1,000 infants screened. The economic benefit would fall to zero when the false-negative rate reached 1.23/1,000 live births. The actual cost to other institutions would vary, but the results in British Columbia indicate the effectiveness of this type of program. 1 figure, 1 table, 10 references.

121

Preventive Screening for the Fragile X Syndrome.

Form: Journal article.

Author: Turner, G.; Robinson, H.; Laing, S.; Purvis-Smith, S.

Source: *New England Journal of Medicine*. 315(10):607-609, September 4, 1986.

Abstract: To determine the number of females at risk of being carriers of the fragile X syndrome, researchers in Sydney, Australia, physically and cytogenetically screened 921 intellectually handicapped persons for the X-linked semidominant fragile X syndrome. Subjects included (1) children ages 5-18 with a moderate to severe handicap (IQ 20-55) who

were enrolled in special schools; (2) children ages 8-12 with a mild handicap (IQ 55-75) who were in special classes; (3) children ages 8-18 with a mild handicap who were enrolled in two special schools; and (4) persons of all ages in institutions, day activity centers, and sheltered workshops. Researchers excluded subjects who had another known diagnosis. Subjects whose parents consented to a limited physical examination were physically examined for (1) gait, (2) measurement of height and head circumference, and (3) neurocutaneous signs on the chest. Researchers counseled the families of those subjects with abnormal karyotypes and, when indicated, interviewed and examined first-degree and second-degree relatives. Subjects contributed 10 milliliters of venous blood collected directly into sodium heparin, enriched with fetal-calf serum, cultured, and examined for the presence of the fragile site at band q27 on the X chromosome. Researchers found 40 probands (28 male and 12 female), representing 36 families. Twelve of the probands had a fragile X-positive second-degree or first-degree relative or both, 11 probands had a positive first-degree relative, and 10 probands had no positive relatives; other probands either refused further participation or were adopted. Prevalence rates for persons with an intellectual handicap and the fragile X syndrome in the sample were 1 per 2610 for males and 1 per 4221 for females. Family studies identified 84 women who were either obligate carriers (fragile X-positive) or at high risk of being carriers, who were under the age of 35, and had no children. These women were given genetic counseling, and the availability of antenatal diagnosis was explained to them. If each of these 84 women had two children, there would be 27 affected boys among their 168 future offspring. The cost of identifying one female subject at high risk of being a carrier was Australian \$3,570. If each at-risk woman would request antenatal diagnosis, the cost to prevent the birth of one intellectually handicapped boy would be

Australian \$11,110 (or \$14,200 if \$500 is included for each chorionic villus biopsy investigation). A conservative estimate for special schooling, invalid pension, and adult hostel accommodations for one intellectually handicapped person is Australian \$1 million over a lifetime. 2 tables, 6 references.

Birth Defects, Mental Retardation, and Chronic Conditions

Mental Retardation, Down's Syndrome, and Developmental Disability

122

Costs of Providing Residential and Related Support Services to Individuals With Mental Retardation.

Form: Journal article.

Author: Ashbaugh, J.; Nerney, T.

Source: *Mental Retardation*. 28(5):269-273, October 1990.

Abstract: Researchers determined costs of services in different types of residential settings in two regions of the country (Michigan and Nebraska) to persons with mental retardation. Investigators studied persons living in 160 group homes, 130 family homes, and 41 apartments from July 1, 1984 through June 30, 1985. Project staff obtained cost data from reports of service provider expenditures on file in the regional offices and checked the reports against audited statements of expenditures completed for each residential provider. Staff compiled information on the total cost of services, cost of residential services per resident, and cost of residential services by type of expenditure. Researchers used simple univariate analyses to indicate the extent to which one variable of interest appeared to be related to another. Analysis showed that the per diem costs of providing residential services for persons with mental retardation in group homes, family homes, and apartments in the Macomb-Oakland Region of Michigan and in Region Five in eastern Nebraska varied far more by type of living arrangement than by resident level of need. The average cost per resident ranged from about \$25,000 to \$50,000 in group homes and from \$10,000 to \$25,000 in family-care homes. In Nebraska the average annual operating cost per person was \$3,084 in foster

care and \$4,190 in adult family homes; equivalent costs in group homes and in apartments with live-in staff and with live-out staff were \$15,755, \$11,098, and \$7,094, respectively. In Michigan the average operating costs for staffed facilities and group homes were \$31,540 and \$32,287 respectively; the equivalent costs in the community training and adult family homes were \$10,757 and \$13,724, respectively. Nearly all of the variation in the per diem costs of staffed, as opposed to family-operated, living arrangements could be explained in terms of staff-to-resident ratios and staff compensation levels. 23 references.

123

Health Care Financing for Severe Developmental Disabilities.

Form: Monograph.

Author: Birenbaum, A.; Guyot, D.; Cohen, H.J.

Source: Washington, DC, American Association on Mental Retardation, 150 p., 1990.

Availability: American Association on Mental Retardation, 1719 Kalorama Road, NW., Washington, DC 20009.

Abstract: *Health Care Financing for Severe Developmental Disabilities* analyzes the utilization and financing of health care for children and young adults with two different types of developmental disabilities: Autism and severe or profound mental retardation. The purpose of the study was to collect reliable and accurate national data useful for making public policy. Chapters include (1) The Problem and the Aims of the Study; (2)

Methodology; (3) The Children and Young Adults in the Study (the criteria used to determine eligibility for inclusion in the sample); (4) Utilization of Health Care and Medical Services; (5) Expenditures (differences in expenditure patterns among the two developmental disabilities under study); (6) Third Party Coverage and the Uninsured; (7) The Financing of Services; (8) Family Out-of-Pocket Expenses; (9) Family Hardships; (10) Policy Recommendations on the Financing of Care; and (11) Summary and Conclusions. Average annual total expenditures for basic medical and other health care, including hospital charges, doctors' fees, emergency room visits, and dental charges, were found to be four times greater for children with severe mental retardation (\$4,000) than for those with autism (\$1,000). The average family makes payments that appear manageable, but there are some families who pay catastrophically high amounts for the health care of their disabled children. The average family with an autistic child under age 18 at home spent about \$900 annually on health care and related services, while the family with a severely retarded child living at home paid out-of-pocket an average of \$1,700 for health care and personal care. (Healthy children incur about \$414 for health care per year.) Proposals to increase assistance to families with severely and profoundly mentally retarded children must seriously consider a targeted approach to those with extreme medical needs, as some families must pay more than 20 percent of their income to meet these expenses. 9 figures, 54 tables, 135 references.

124

Toward Timely Corrections of Mental Retardation/Developmental Disabilities Policy: Commentaries on Braddock et al.

Form: Journal article.

Author: Boggs, E.M.

Source: *American Journal of Mental Deficiency*. 92(2):134-135, September 1987.

Abstract: The author presents a commentary on a 1987 article by Braddock et al., National Study of Public Spending for Mental Retardation and Developmental Disabilities, concerning timely corrections and improvements to mental retardation and developmental disabilities policy. Braddock and his colleagues at the University of Illinois in Chicago have been breaking ground for mental retardation in disciplines that were unknown 25 years ago, particularly in the use of computer science and systems theory for public policy analysis. The article makes it clear that it is the states, not the federal government, that drive the community agenda. Documentation of who pays for what services to which children and adults is increasingly difficult because of the number of agencies involved at each level, the lack of uniformity in the way in which state and local agencies report their federal and demographic data, and the fact that some very relevant data are not collected at all. In the late 1970's, the National Center for Health Statistics developed a proposed broad-based long-term care minimum data set designed to include persons of all ages and types of impairment in all kinds of long-term care settings, nonresidential as well as residential. Recent policy decisions have made clear, however, that this vehicle will not be very useful to workers in the field of developmental disabilities. An independent effort is needed to develop a common statistical framework encompassing the characteristics, needs, and multiple service systems that attempt to accommodate people

with long-term disabilities. The Braddock article's computations can enable us to make still more timely course corrections in our future policy trajectories. 6 references.

125

Governmental Spending for Mental Retardation and Developmental Disabilities, 1977-1984.

Form: Journal article.

Author: Braddock, D.; Hemp, R.

Source: *Hospital and Community Psychiatry*. 37(7):702-707, July 1986.

Abstract: In 1985, researchers examined the impact of the Omnibus Budget Reconciliation Act of 1981 and each state's response to it in the context of federal, state, and local spending for institutional and community services for mental retardation and related developmental disabilities, both before and after the passage of the Budget Reconciliation Act. The study had three components: State government expenditure analysis, federal expenditure analysis, and intergovernmental analysis. The state government expenditure analysis identified and described the financing of community and institutional services for mentally retarded and developmentally disabled persons in each state and the District of Columbia; nearly 200 official state budgets spanning fiscal years 1977-1984 were analyzed. The federal expenditure analysis examined data pertaining to services, research, training, income maintenance, construction, and information coordination in 82 federal programs between 1935 and 1985. The intergovernmental analysis integrated financial data emanating from the state and federal analyses for fiscal years 1977-1984 with data on local spending in fiscal year 1984 into a unified intergovernmental data set. The data were analyzed to determine how state and federal funding of institutional operations

compared with that of community services during fiscal years 1977-1984. Researchers adjusted data for inflation. Results reveal that combined state and federal government spending grew by 23 percent (from \$6.28 billion in 1977 to \$13.36 billion in 1984) despite diminished growth in federal spending after passage of the Budget Reconciliation Act. Combined state and federal expenditures for community services grew by 40 percent (from \$1.56 billion in 1977 to \$3.783 billion in 1984), primarily because of a rise in state spending. Community services include aggregate support for individual foster family placements, small group homes, large congregate care private facilities, and day activities. Total state and federal spending for institutional services plateaued during fiscal years 1977-1984, as a 26 percent drop in state appropriations was offset by an infusion of federal dollars, mostly through the Intermediate Care Facilities for the Mentally Retarded program. Annually the average real rate of growth of federal spending was 9.1 percent for fiscal years 1977-1980 and 2.8 percent for 1981-1984. State-source expenditures exceeded the inflation rate by 0.64 percent per year. Local funds included school district expenditures for special education services to mentally retarded pupils and funds provided by county and municipal government for noneducational purposes, such as local habilitation services and sheltered workshops. Federal, state, and local expenditures were estimated to total \$16.49 billion in fiscal 1984. Specific cost figures were not mentioned in the source document for (1) total state and federal spending for institutional services during fiscal years 1977-1984, (2) the average real rate of growth of federal spending for fiscal years 1977-1980 and 1981-1984, and (3) state-source expenditures that exceed the inflation rate by 0.64 percent per year. 4 figures, 30 references.

126

National Study of Public Spending for Mental Retardation and Developmental Disabilities.

Form: Journal article.

Author: Braddock, D.; Hemp, R.; Fujiura, G.

Source: *American Journal of Mental Deficiency*. 92(2):121-133, September 1987.

Abstract: Researchers expanded on a 1981 study to analyze mental retardation and developmental disabilities (MR/DD) expenditures in each state government's published executive budget. The more recent analysis included budgets from fiscal year (FY) 1977 through FY 1986. Investigators obtained 250 published state government budgets both from libraries and directly from the states. Project staff photocopied relevant material on MR/DD funding and agency organization and prepared ledger sheets summarizing MR/DD funding in the same terms used in each state's budget. While conducting telephone interviews, staff used ledger sheet information that was sensitive to each state's budgeting context. These interviews enabled the study team to develop a uniform fiscal classification system that delineated (1) institutional and community services spending, (2) spending by level of government (state and federal), and (3) statutory revenue sources. Trends identified included (1) continuing growth in spending for community services, (2) contraction of total spending for institutional operations, and (3) predominance of Intermediate Care Facilities for the Mentally Retarded (ICF/MR) support in large (more than 15 beds) congregate care settings. Between 1977 and 1986, the institutional census declined from 149,176 to 100,421. Costs of care in institutional settings climbed from a national average of \$44.54 per day in FY 1977 to \$126.79 per day in FY 1986. Total spending in the states for

community programs climbed rapidly, advancing from \$0.910 billion in FY 1977 to \$4.422 billion in FY 1986. Excluding federal income maintenance payments, in FY 1986 the nation was spending approximately equal sums in both sectors, \$4.647 billion in institutional settings versus \$4.422 billion in community settings. Fully 87 percent of all reimbursement budgeted under the ICF/MR program in FY 1986 was associated with the larger settings (more than 15 beds). Given the potentially much larger constituencies for MR/DD services existing outside large state-operated institutions and the continuing decline of the institutional census, analysis shows that the contemporary budgeting of ICF/MR funds predominantly inside institutions is anachronistic. No additional cost information is provided in the source document. 6 figures, 1 table, 38 references.

127

Impact of Low Birthweight on Special Education Costs.

Form: Journal article.

Author: Chaikind, S.

Source: *Journal of Health Economics*. 10(3):291-311, October 1991.

Abstract: Using the 1988 Child Health Supplement (CHS), a sub-sample of the National Health Interview Survey, researchers assessed the relationship between low birthweight and special education in the U.S. and the subsequent costs of educating a special pupil. Researchers used a general measure of enrollment in special education of any kind and a second more limited measure of special education participation, which included children in special education because of a developmental delay, emotional/behavioral problem, or learning disability. The sample consisted of 8,000 in-school children between ages 6 and 15. Researchers calculated the

probability of attending special education, and held constant individual, family, and regional variables. Survey data show that normal birthweight babies have a 6.9 percent chance of being in special education of any kind, whereas low birthweight babies have an 11.3 percent chance of being in special education. Under the multivariate estimation, researchers used a logit function with a dichotomous dependent variable, special education, and several measures of the family's home environment, the child's characteristics, and regional differences. Children who weighed less than 2,500 grams at birth were almost 50 percent more likely to be enrolled in any type of special education than children who were of normal weight at birth, controlling for medical, family, social, and economic factors. Children in low-income, single-parent households were more likely to be in special education than children in two-parent households with a highly-educated head-of-household; girls were less likely to be enrolled in special education than boys and the likelihood of enrollment in special education increased with age. Researchers estimated the average per pupil special education total expenditures to be \$6,335, 2.3 times the cost of regular education (\$2,780), or an incremental cost of \$3,555 per pupil annually. The authors substituted the \$3,555 per pupil costs to estimate the effect of low birthweight on enrollment in special education programs in aggregate (i.e., assuming that low birthweight affects all handicapping conditions on average equally). In terms of 1989/1990 dollars, the estimated per pupil cost was \$4,350, derived by inflating the \$3,555 1985/1986 cost by the Consumer Price Index between the two periods, which was an increase of approximately 16.5 percent, and by adding a real growth rate of 1.25 percent annually. The constant \$4,350 estimate indicates a total expenditure for special education in 1989/1990 of between \$19 and \$20 billion, depending on caseload growth. Under the broader measure

of all types of special education, the simple estimate is \$466.1 million and the multivariate estimate is \$370.8 million. Under the learning disabled, emotional problems, or developmentally delayed, the simple estimate is \$317.8 million and the multivariate estimate is \$254.2 million. The authors conclude that (1) approximately 85,000 children in special education programs are enrolled due to handicapping conditions that result primarily from the fact that they were born at less than 2,500 grams, and (2) services for these children required approximately \$370 million in expenditures in the 1989/1990 school year. 4 tables, 38 references.

128

Down Syndrome: Economic Burdens and Benefits of Prevention.

Form: Journal article.

Author: Conley, R.W.

Source: *Basic Life Science*. 36:35-59, 1985.

Abstract: A researcher develops a model to conduct economic analysis of aneuploidy and presents some empirical estimates of the costs of aneuploidy and the benefits of prevention. Aneuploidy is one of a large number of diseases, accidents, and genetic conditions that adversely affect people's well-being by causing impairments, handicaps, possible premature death, and other ultimate effects such as loss of productivity. The social cost of aneuploidy is equal to the cost of the values of all the ultimate effects caused by the condition, such as loss of output, the value of psychic distress, and the value of all the prevention and treatment programs. Cost-benefit analysis is directly related to social costs. Problems in conducting economic studies include those of missing data, variables without a market (monetary) value, different weighting of components of costs and benefits, joint benefits, distribution, defining the appropriate

decision units, and discounting; also considered are technical cost problems, technical problems of benefits, and ambiguity of benefits of preventing aneuploidy. Economic analyses can neither fully measure costs and benefits nor resolve conflicts in the ways in which people value various components of costs and benefits. Most people with aneuploidy have Down's Syndrome. The researcher develops an estimate of the reduction in social well-being that results because a part of society has this condition. In 1983, estimated social costs of Down's Syndrome included loss of output (among living persons, \$841 million; due to premature death, \$1.75 billion); excess educational expense (\$295 million); excess residential care expense (\$590 million); adult day care (\$146 million); and prevention (\$33 million), for a total of \$3.65 billion. Lifetime costs are also estimated. This is contrasted with costs to prevent Down's Syndrome babies from being born (\$1,000 for abortion, \$650 for amniocentesis). The total costs would be \$32,500,000 for amniocentesis and less than \$500,000 for abortion. Here, a breakeven point is reached as long as at least one case of Down's Syndrome is detected out of every 306 examinations. 5 tables, 17 references.

129

One Year of Health and Social Services for Children 3-7 Years Old With Down Syndrome: A Calculation of Costs in Two Danish Counties.

Form: Journal article.

Author: Goldstein, H.; Philip, J.; Dupont, A.

Source: *Social Psychiatry*. 21(3):134-138, 1986.

Abstract: Researchers conducted a study to calculate the 1-year costs of health and social security system support for children aged three to seven with Down's Syndrome (DS), who

lived at home in two Danish counties. The health service and financial support is supposed to meet the needs of the handicapped children and provide the families with facilities. The total population of DS patients included 16 in one county and 6 in the other. Researchers interviewed the children's parents or foster parents and their personal social workers about the child's contacts with the health and social security system in the 1-year period before the interview. Some calculations were made on the basis of fixed and known prices, such as the cost of one child in a kindergarten for handicapped children for 1 year. Other services were researched, such as the number of consultations in outpatient clinics and number of days in hospitals, and services from social workers, school psychologists, speech therapists, etc. In addition to health services and social security services, researchers considered transportation costs. Twenty of the 22 children attended some sort of day institution. The minimum average cost of supporting one child (and his or her family) during 1 year was calculated at 132,882 Danish Crowns, equal to 9,280 British pounds sterling or \$13,436 American dollars. In spite of the decentralized system, the difference between the two counties in terms of their support was very small and was caused by differences in a number of additional handicaps, especially in one child, and not by different standards of support. 1 figure, 4 tables, 12 references.

130

Some Financial Costs of Caring for Children With Down Syndrome at Home.

Form: Journal article.

Author: Gunn, P.; Berry, P.

Source: *Australia and New Zealand Journal of Developmental Disabilities*. 13(4):187-193, December 1987.

Abstract: Researchers conducted a study to determine the extent to which Australian families with a Down's Syndrome child incurred significant financial expenses in caring for the child. Over a 4-week period, 37 families with a child with Down's Syndrome (23 boys, 14 girls) and 20 comparison families (17 boys, 13 girls) recorded the expenses involved in rearing their children. When the study began, the children ranged in age from 1 year 9 months to 8 years 9 months. The Handicapped Child's Allowance was 85 Australian dollars (A\$) per month. Families completed a series of questionnaires that determined weekly expenses in addition to basic costs for food, shelter, and clothing (such as regular medication, special foods, transport, extra lessons, specialist costs, and baby sitting). Another questionnaire sought to estimate holiday (vacation) costs for each family; a third, at the end of the year, gathered information on the major costs involved in rearing these children that were additional to those covered either by weekly or holiday costs. Results showed that while all families incur considerable financial costs in raising children, there were additional expenses for the families with the Down's Syndrome child, and there was less participation in activities such as dance, music, gymnastics, and sports by these families. Sample costs, per week, for each group (Down's Syndrome and comparison) were as follows: Medication (A\$12 versus A\$4.72), special foods (A\$6.50 versus A\$4.29), transport (A\$33 versus

A\$15), activities (A\$9.30 versus A\$17), and specialists (A\$24 versus A\$5.75). The main difference between families for holiday expenses was in connection with transport costs and child care. Findings suggested that an allowance such as the Handicapped Child's Allowance is a realistic acknowledgement of the rights of families to financial support. 5 tables, 4 references.

131

Benefit-Cost Analysis of Supported Competitive Employment for Persons With Mental Retardation.

Form: Journal article.

Author: Hill, M.L.; Banks, P.D.; Handrich, R.R.; Wehman, P.H.; Hill, J.W.; Shafer, M.S.

Source: *Research in Developmental Disabilities*. 8(1):71-89, 1987.

Abstract: Researchers present a cost-benefit analysis of placing persons with mental retardation and other severe disabilities into supported competitive employment, focusing on the financial outcomes of supported competitive employment through a program evaluation of economic or financial variables. The analysis is discussed from two perspectives: (1) Benefits and costs to the person with severe disabilities receiving supported competitive employment services (the consumer) and (2) benefits and costs to the taxpayer. The supported competitive employment model is presented as illustrative of a habilitation program allowing greater monetary returns to society than traditional adult service programs. The analyses evaluate services provided by the Rehabilitation Research and Training Center (RRTC) from 1978 to 1986 to persons with severe disabilities in several predominately urban areas of Virginia. The majority of the 214 consumers placed in supported competitive

employment were described as moderately mentally retarded. The most frequent types of jobs in which the consumers were placed were entry-level nonskilled positions such as janitors or dishwashers. The average length of time that consumers were employed was 21 months. Actual monetary outcomes incurred from the supported competitive employment were identified from permanent records and information supplied by cooperating agencies. These outcomes were conceptualized by their effect on government expenditures and consumer outcomes. All figures were converted to constant 1986 dollars and a 5 percent discount rate was applied to all figures. Results indicate that supported competitive employment is a financially prosperous venture from both perspectives. Benefits included (1) increased revenue, of which the consumer received the benefit of total consumer income and fringe benefits and the taxpayer received the benefit of taxes collected from the consumer and employer tax credit; (2) decreased service expenditures; and (3) decreased supplemental security income (SSI) payments. Total costs included (1) operational costs to the taxpayer, (2) lost workshop earnings to the consumer, (3) decreased government subsidy to the consumer, and (4) those taxes paid by the consumer and those credited to the employer. From the consumers' perspective, for every \$1 relinquished in taxes, SSI, and foregone workshop earnings, \$1.97 was received in increased income; the net benefit per year was \$3,894 per consumer. From the taxpayers' perspective, for every \$1 expended for the funding of supported competitive employment programs and in lost tax revenues realized by the provision of targeted jobs tax credits, \$1.87 was accumulated in benefits; the net yearly benefit to the taxpayer was \$4,063 per consumer. 5 tables, 19 references.

132

Ventura Planning Model: A Proposal for Mental Health Reform.

Form: Journal article.

Author: Jordan, D.D.; Hernandez, M.

Source: *Journal of Mental Health Administration*. 17(1):26-47, Spring 1990.

Abstract: The Ventura Planning Model, a proposal for public mental health reform, addresses the decline in mental health funding and offers a rationale for increased support (and funding) for public mental health services. The Planning Model grew out of the experience of implementing and operating the Ventura (California) Children's Demonstration Project. The model has five characteristics, or planning steps: (1) Multi-problem target population; (2) systems goals; (3) interagency coalitions; (4) services and standards; and (5) systems monitoring and evaluation. The Project implemented these planning steps with an infusion of \$1.54 million in funds from the state legislature. The Project offset a portion of its cost by reducing other public agency costs. Specifically, the cost avoidance achieved in group home, state hospital, nonpublic school residential placements, juvenile justice incarcerations, and special education costs was \$1,013,852, or 66 percent of the annual direct expenses of \$1,528,265 (annualized from 36 months of operations). The Project also improved a variety of client-oriented outcomes such as costs of (1) group home care, (2) child and adolescent state hospital programs, (3) nonpublic school residential placement, (4) juvenile justice incarceration, and (5) special education placement. The success of the Project in offsetting its costs has led the legislature to provide additional funds for three more California counties to implement the model for children and youth, and \$4 million a year for 4 years for Ventura County to test the model for adults and senior citizens. Emphasizing cost

offsets in addition to client-centered outcomes provides a practical rationale for proposing increases in public mental health funds. This rationale also implies substantial changes in the operations of many public mental health agencies. 2 figures, 7 tables, 9 references.

Birth Defects, Mental Retardation, and Chronic Conditions

Genetic Disorders and Chronic Conditions

133

New Genetics: Will It Pay Its Way?

Form: Journal article.

Author: Chapple, J.C.; Dale, R.;
Evans, B.G.

Source: *Lancet.* 1(8543):1189-1192,
May 23, 1987.

Abstract: Using a broad-brush approach for (1) the genetic disorders of cystic fibrosis, beta-thalassemia, sickle-cell anemia, hemophilia, and muscular dystrophy, and (2) known 1985-1986 costs for inpatient hospital care only, researchers compared possible financial savings from a DNA diagnostic service with the cost of setting up and running a laboratory. The study area comprised the North West (NW) and South East (SE) Thames Regional Health Authorities (RHA), each of which have a population of about 3.5 million and 45,000 live births a year. The Hospital Activity Analysis (HAA) figures for NW and SE Thames in 1984 for various genetic diseases were obtained to ascertain the number of discharges, deaths, and occupied beds for each disorder. Clinicians specializing in the treatment of various genetic disorders advised on their prevalence in the community, survival and treatment rates, and the likely number of cases each year in which antenatal diagnosis could be made and an affected pregnancy terminated. Researchers compared figures for the regions to ascertain whether the method was applicable to both, and used a computer model to calculate costs for each case prevented. The model applied the survival factor for each disorder to give an estimated number of cases in each future year arising from a single year's births within the regions. Researchers estimate that genetic screening

would prevent annually (1) two cases of cystic fibrosis in NW, (2) 5 cases of beta-thalassaemia in NW and SE, (3) 8 cases of sickle-cell anemia in NW and SE, (4) 1.5 cases of haemophilia, and (5) 2.5 cases of muscular dystrophy. Clinician geneticists estimate the total costs of running a DNA laboratory as 83,000 pounds. Results show that there would be clear savings at the hospital level if a DNA screening laboratory were set up in each region. For example, calculations using marginal costs for drug treatments associated with hemophilia and cystic fibrosis showed cost savings of 90,000 pounds over a 10-year period compared with 83,000-pound costs associated with termination of these and other pregnancies. Additionally, once a program is set up, new developments will make it even more cost-effective. Researchers concluded that RHA's should attach high priority to the setting up of DNA diagnostic laboratories. 4 tables.

134

New Genetics: Options in Costing Exercises.

Form: Journal article.

Author: Evans, B.G.; Chapple, J.C.

Source: *Public Health.* 102(4):323-328,
July 1988.

Abstract: With the large increase in the numbers of genetic disorders capable of being diagnosed antenatally, the demand on some research-oriented services in Britain is outstripping supply. The demand for these tests from high-risk families is likely to increase significantly. Regional or supraregional laboratories need to ascertain

whether a service offered to high-risk families will be cost beneficial. Researchers summarize the current options here. Four approaches are possible: (1) A full cost-benefit analysis (which is being undertaken at certain centers); (2) an attempt at a cost-benefit analysis based on guesstimates; (3) the use of data from hospital activity analysis and minimal hospital costs estimated to determine if, in hospital savings alone, such a screening program could be cost beneficial; and (4) an estimate of the cost per case prevented for certain genetic disorders, with some judgment made as to how reasonable this expenditure is. The authors present the fourth approach as the simplest and considered it in detail. The cost per case terminated using this method is approximately 4,000 British pounds. Cost was determined by estimating the following: Running costs of a DNA screening service (60,000 pounds); capital costs per year (23,000 pounds); chorionic villus sampling (CVS) (3,640 pounds); counseling (14,000 pounds); central register (1,150 pounds); and additional terminations (abortions) (3,900 pounds), for a total cost of 105,690 pounds. Divide this by the estimated number of cases terminated (26, which is the estimated number of cases picked up by CVS in this example) and the result is 4,065 pounds. Compared with the high costs of treating children with genetic disorders, the costs of running a screening program for high-risk families is small. No figures were given for the expected increased demand from high-risk families for genetic testing. 2 tables, 5 references.

135

Inadequacy of Health Care for the Nation's Chronically Ill Children.

Form: Journal article.

Author: Gale, C.A.

Source: *Journal of Pediatric Health Care*. 3(1):20-27, January-February 1989.

Abstract: The author notes that a patchwork of financing programs and services exist to meet the needs of the approximately 750,000 children in the United States with a severe chronic illness, but from a national perspective, (1) coverage is incomplete, (2) eligibility criteria are uneven across states, and (3) care is disjointed. The sources of financial support for this care (i.e., private insurance, philanthropic support, research funds, disease-oriented voluntary associations, special state programs, Medicaid, and Crippled Children's Services) typically leave many gaps in coverage. The families of these children face many years of mounting medical bills with little help in sight. For example, home care for a severely disabled child costs \$7,000-\$8,000 per year compared with a \$40,000 annual cost for institutionalizing the child, yet parents are given little encouragement (financial or otherwise) to keep their disabled children at home. Another area of concern is early intervention and education. If intervention for handicapped infants is delayed until age 6, education costs to age 18 are estimated at \$53,350; if these same intervention services begin at birth, education costs are estimated at \$37,272, a saving of \$16,078. Additionally, for every \$1 invested in high quality preschool programming there is a \$3 reduction in public special education costs. Statistics show that money would be well invested in prevention and health promotion services such as prenatal care and early screening. Research in Alabama shows that for every \$1 spent on preventive maternal and child health care, the state saves between

\$5 and \$10 on long-term institutional care for a severely retarded child. In the author's view, the nation must establish a national policy to (1) provide an organized system of health care for the nation's chronically ill children; (2) address current inadequacies; and (3) provide comprehensive, ongoing care for these children and their families. Nurses can be an effective voice in articulating the special needs of such children to local communities and agencies that provide funding and care. Nurses must act as advocates for chronically ill children and their families and encourage public and private insurance companies to (1) identify gaps in coverage for care and services (e.g., Medicaid in some states does not provide eyeglasses; physical therapy; speech, hearing, and language disorder services; occupational therapy; and dental services); (2) define ways to increase the numbers of handicapped children covered by insurance (e.g., eliminate clauses restricting coverage for preexisting conditions); and (3) improve the extent and quality of services offered (e.g., covering home health care by specially trained personnel). 3 tables, 24 references.

136

Cost-Effectiveness of Different Strategies for Prevention of Congenital Rubella Infection: A Practical Example From Iceland.

Form: Journal article.

Author: Gudnadottir, M.

Source: *Reviews of Infectious Diseases.*
7(Supplement 1):S200-S209,
March-April 1985.

Abstract: From June 1979-June 1981 Iceland conducted a nationwide program to vaccinate females aged 12-40; the strategy chosen was the selective vaccination of seronegative women and teenage girls. The program continues with vaccination of seronegative girls age 12 every year. Researchers compared the

cost-effectiveness of this strategy with (1) the vaccination of all children and seronegative young adult women; (2) the vaccination of all children in early childhood (age 18 months) with combined vaccines for rubella, measles, and mumps, and revaccination at age 12 of all teenagers; and (3) vaccination of nonpregnant seronegative women who are willing to use contraceptives for 2-3 months afterward. The cost of the program was compared with the preprogram direct cost of congenital rubella infection in Iceland. Thirty children with normal intelligence were born with rubella-associated deafness between 1955 and 1964; the cost of educating them to the standard of healthy children cost as much as educating 165 healthy children. The rubella epidemics of 1954-1955 and 1963-1964 left three persons with multiple congenital defects, including deafness and subnormal intelligence.

Researchers estimate that the cost to educate and maintain one multiple defect rubella victim reaching age 60 is almost equal to the total cost of the rubella vaccine campaign that was carried out between 1979-1981. During the rubella epidemic of 1978-1979, total direct costs of rubella infection during pregnancy included (1) \$24,515 for 14,709 diagnostic tests, (2) \$68,640 for 104 therapeutic abortions, and (3) \$20,000 for heart surgery and hospital beds for patients with congenital rubella syndrome (total costs: \$113,155).

Total cost estimates for strategies for protecting 50,000 females in Iceland against rubella infection was (1) \$250,000 for vaccination without screening, (2) \$84,000 for screening and vaccinating seronegative females, and (3) \$226,000 for vaccine for 46,300 children between ages 2 and 12.

Previously unscreened females aged 12-40 were screened and nonpregnant seronegative females were vaccinated for \$83,000, or about one-third the \$226,000 cost of vaccinating all children aged 2 to 12 years. Continuation of this program by vaccinating all seronegative 12-year-old girls was two to three times more

cost-effective than vaccination of all 2-year-old children, saving an average of \$10,000-\$14,000 per year. Use of rubella vaccine in combined vaccines proved the most expensive strategy (\$24,000 for 4,000 doses of the combination vaccine versus \$20,000 for the same amount of rubella vaccine), with or without revaccination of teenagers. Specific cost figures for the total cost of the rubella vaccine campaign that was carried out between 1979-1981 were not mentioned in the document. 5 tables, 37 references.

137

Cost Savings and Economic Considerations Using Home Intravenous Antibiotic Therapy for Cystic Fibrosis Patients.

Form: Journal article.

Author: Kane, R.E.; Jennison, K.; Wood, C.; Black, P.G.; Herbst, J.J.

Source: *Pediatric Pulmonology*. 4(2):84-89, 1988.

Abstract: A cystic fibrosis (CF) center used home intravenous antibiotic therapy (HIVAT) as an alternative to continued hospitalization during a 1-year study between January and December 1984. After thorough individual clinical and financial evaluation, researchers selected 27 of 41 CF patients who had been admitted to the University of Utah Cystic Fibrosis Center to complete a HIVAT treatment course lasting from 14-21 days (mean 15.1 days). The HIVAT treatment involved at least three aerosol treatments and chest physiotherapy daily at home with the aid of family members. By arrangement, two commercial home parenteral therapy companies provided antibiotics, syringe pumps, supplies, and at-home supervision of the treatment. Physician followup was during clinic weekly, or the first clinic day closest to the end of therapy. The 27 patients (ages 6-28, mean age 16) incurred a total of \$698,587

in hospital charges and physician fees during 96 admissions. The average charge for 974 inpatient days was \$717 per day (\$7,280 per admission). After an average of 10.2 days of inpatient care, the 27 patients underwent 79 courses of HIVAT for an additional 8 days; 21 additional HIVAT courses in 6 of these patients were initiated on an outpatient basis between frequent readmissions. The 811 days of HIVAT resulted in \$85,027 total charges by two home care companies. The charges per day of HIVAT by one company were almost twice that of the other. The source document offered no explanation for the practice of one company in compounding fees for antibiotics and services at nearly twice the rate charged by the other company. The average daily cost of HIVAT was \$108/day. If the HIVAT patients had completed the course of intravenous antibiotic therapy while hospitalized, the projected total inpatient costs would have been \$589,271. Therefore, the 811 days of HIVAT over a 1-year period resulted in total estimated direct cost savings of \$501,770. The average savings per course of HIVAT were \$5,017, or \$618/day. Researchers concluded that (1) HIVAT was a safe, less expensive alternative to prolonged hospitalization with few complications; and (2) additional cost savings could have been realized by cost comparison between home health care companies offering comparable services. 4 tables, 21 references.

138

Study of Medical Costs Associated With Selected Genetic Disorders in Texas.

Form: Journal article.

Author: McCabe, E.; Patterson, P.J.; Botsonis, H.; Day, D.W.; Lockhart, L.; Martinec, J.D.; Weber, B.; Godbout, R.; Malitz, D.

Source: *Birth Defects.* 26(2):132-138, 1990.

Abstract: Researchers attempted to quantify the medical costs associated with 11 selected genetic disorders in Texas, using two data sources: Medicaid and the program for Chronically Ill and Disabled Children (CIDC). There were 464,947 paid claims for services identified with one of the 11 targeted diseases during the study period for Medicaid data (April 1, 1987-December 31, 1987). A total of \$115.6 million was billed and \$66.1 million was paid on behalf of claimants with one or more of these 11 disorders. Of the \$66.1 million, 49.2 percent went towards congenital heart disease, 34.5 percent for Down's Syndrome, 6.2 percent for spina bifida, 4.8 percent for sickle cell disease, 3.2 percent for cystic fibrosis, 2.4 percent for muscular dystrophy, 2.3 percent for cleft palate, 1.4 percent for neurofibromatosis, 1.3 percent for hemophilia, 0.6 percent for thalassemia/Cooley's anemia, and 0.6 percent for phenylketonuria. (Total is more than 100 percent because some claimants had more than one disease.) Total payments for all services by CIDC for 1987 equaled \$10.65 million: 47.5 percent went towards congenital heart disease, less than 0.1 percent for Down's Syndrome, 10.6 percent for spina bifida, 0.4 percent for sickle cell disease, 18.5 percent for cystic fibrosis, 16.9 percent for cleft palate, 5.4 percent for hemophilia, and 0.8 percent for neurofibromatosis. Diseases not covered by CIDC in 1987 were muscular dystrophy, thalassemia/Cooley's anemia, and phenylketonuria. Researchers conclude that

(1) their estimate of close to \$100 million in payments for these disorders in 1987 represents a low estimate of the true medical costs for care of these patients; (2) these 11 disorders represent a disproportionate share of Medicaid payments; (3) CIDC is a significant source of support for the medical care of these patients in Texas; and (4) referral for genetic services represents a significant barrier for persons who need these services. 1 table.

139

Need for a Science of Community Genetics.

Form: Journal article.

Author: Modell, B.

Source: *Birth Defects.* 28(3):131-141, 1992.

Abstract: A discipline of community genetics (services based on population screening) is needed with the following responsibilities: (1) Describing the epidemiology of genetic disorders; (2) educating the public and the medical profession; (3) providing a liaison with support associations; (4) auditing to monitor service delivery and analyze costs and benefits; and (5) providing a liaison with health authorities to ensure delivery of appropriate genetic services. The author discusses each of these points in detail and presents hypothetical calculations. Cost-benefit analysis of genetic services is important because (1) money represents peoples' work, so one should account for the money spent on health care; and (2) in practice, to get screening services funded one is forced to show that they save money. A general approach for cost-benefit analysis of genetic services must be developed that is based on the objectives of ameliorating suffering and buying health, and is equally acceptable to the medical profession, patients, and the public. It should consider both treatment and prevention, and financial and nonfinancial costs and benefits. This will require improved dialogue between

economists and clinicians. As an example, a flow chart is presented summarizing some of the real costs and benefits of screening for prenatal diagnosis, such as 1.80 pounds per person tested and informed, 60 pounds per at-risk couple, 670-700 pounds per prenatal diagnosis, and 1,350-1,650 pounds per homozygote detected and replaced. There is a demonstrable need for a scientific framework for community genetics, and a considerable basis for consensus already exists. 5 figures, 3 tables, 11 references.

140

Financing Health Care for Disabled Children.

Form: Journal article.

Author: Newacheck, P.W.; McManus, M.A.

Source: *Pediatrics*. 81(3):385-394,

March 1988.

Abstract: Researchers used data from the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES) to assess (1) use of inpatient hospital services, physician and nonphysician services, prescribed medications, and health care equipment and supplies by chronically ill children; (2) total charges for the services; and (3) family out-of-pocket medical care expenses and other sources of medical care payment. The study compared use and expenditure levels for the population younger than age 21 with and without limitation of activity due to chronic health problems. Collecting data on health insurance coverage and on financial aspects of contacts with health care providers, NMCUES involved interviewing members of 6,600 households five times over 1 year regarding health care services. Of the 6,245 people younger than age 21 who completed the survey, only 249 were limited in their activities. Since the NMCUES sample frame excluded the institutional population, a large

segment of the most severely ill children and youths were not included. Analysis revealed that children with limitations in their activities used more medical services than other children, especially hospital-based services and services provided by health professionals other than physicians. Charges and out-of-pocket expenses were two to three times higher on average for children with disabilities; total charges for health services averaged \$760 per child limited in activity compared with \$263 for other children. In total dollars, disabled children and youth accounted for \$2.4 billion of \$21.9 billion in charges for health services provided to the population younger than age 21 (4 percent of the children and youth, those with disabilities, accounted for 11 percent of total health care expenditures). Charges and out-of-pocket expenses were found to vary greatly from individual to individual; in fact, most of the children with disabilities in 1980 had low charges and out-of-pocket expenses. Prevalence of limitation of activity varied according to the sociodemographic characteristics of children and their families. Disability was more common among teenagers and young adults, boys, white children, and children in families with incomes below the poverty level. Compared with disabled children with low medical charges, disabled children with higher medical care charges tended to be older and more likely to come from low income families; no substantial differences were apparent by sex or race. Public and private third-parties paid 82 percent of all charges for services provided to disabled children and youth. 7 tables, 15 references.

141

Cardiac Care for Infants: Determinants of Hospital Charges for Acute Care.

Form: Journal article.

Author: Pearson, G.D.; Kidd, L.; Beittel, T.M.; Neill, C.A.

Source: *American Journal of Diseases of Children.* 145(12):1397-1400, December 1991.

Abstract: Researchers analyzed hospital use and inpatient charges at a tertiary referral center for infants hospitalized for cardiac disease in the first year of life. Patient data included demographic information, birthweight, source of medical insurance, charges for inpatient care, type of surgery if applicable, number of admissions, total number of days in the hospital and intensive care unit during the first year of life, cardiac diagnoses, extracardiac defect(s), and outcome at 1 year of age. Cardiac disease was classified as complex or noncomplex based on severity. Complex defects comprised those cases in which functioning heart ventricles were not adequate; extracardiac anomalies included chromosomal abnormalities, mendelian and other syndromes, and other major anomalies. For 93 infants hospitalized between August 1987 and June 1989, there were 1.8 admissions per patient, with a median stay of 14 days and 24.7 percent who required more than 28 days of acute patient care. The infant mortality rate in the total cohort was 25.8 percent (24 of 93 patients). Sixty-six patients underwent 88 surgical procedures, or 0.9 per study patient and 1.3 per patient who underwent surgery. Total hospital charges, excluding professional fees, in the first year of life were \$3,417,612 which represents \$36,749 per infant and \$35,386 per survivor. Reimbursement totaled 93.2 percent of charges. Multivariate analysis revealed that complex cardiac disease, surgery, and length of stay in the intensive care unit were

significantly associated with increased charges, while extracardiac anomalies, birthweight, outcome, and type of insurance were not. For children younger than 1 year, the present value of lifetime earnings was estimated at \$191,184. Researchers estimated the economic benefits of averting death in infancy for the 69 survivors to be \$13,191,696 compared with total hospital expenditures of \$2,441,634, yielding a benefit-to-cost ratio of 5.4 to 1. Results indicated that current treatment of most infants with cardiac disease was both effective and economically justified.

142

Predicting Hospital Charge and Length of Stay for Congenital Heart Disease Surgery.

Form: Journal article.

Author: Silberbach, M.; Shumaker, D.; Menashe, V.; Cobanoglu, A.; Morris, C.

Source: *American Journal of Cardiology.* 72(12):958-963, October 15, 1993.

Abstract: Researchers determined the expenditures for children admitted to a single tertiary referral center for the repair of low surgical-risk congenital heart disease and estimated the influence of age and other preoperative factors on the hospital charge and length of stay. They evaluated 322 consecutive operations between December 1985 and December 1989 for 10 types of low-risk congenital cardiac malformation. Data included total hospital charges for inpatient care (excluding professional fees), source of payment, home to hospital distance, and inhospital mortality for children less than 17 years of age who had cardiac surgery during the specified time period. Multiple regression analysis of variance was used to predict the influence of the primary diagnosis and various preoperative parameters. Primary diagnoses, hospital charges with standard deviation (SD), and length of stay in days with SD per patient

included (1) atrial septal defect, \$18,030 (SD \$5,830), 5.9 (SD 1.2); (2) ventricular septal defect, \$27,488 (SD \$22,885), 9.7 (SD 11.4); (3) tetralogy of fallot, \$37,290 (SD \$34,854), 11.3 (SD 7.9); (4) coarctation, \$22,527 (SD \$17,318), 9.7 (SD 6.9); (5) aortic stenosis, \$29,056 (SD \$11,077), 8.0 (SD 2.7); (6) complete atrioventricular canal, \$37,545 (SD \$17,075), 11.1 (SD 6.9); (7) transposition of great arteries, \$29,303 (SD \$11,566), 9.4 (SD 4.8); (8) membranous type subaortic stenosis, \$23,686 (SD \$9,053), 7.6 (SD 3.1); (9) partial atrioventricular canal, \$32,195 (SD \$30,167), 13 (19.1); and (10) abnormal tricuspid or mitral valve canal, \$42,194 (SD \$24,406), 11.9 (SD 7.8). The average hospital charge was \$27,262 (SD \$20,644) and the postoperative length of stay was 9.3 days (SD 8.3). Age at operation alone did not influence the dependent variables. The diagnosis of atrial septal defect or coarctation of the aorta decreased the mean charge, whereas the 8 other primary diagnoses did not significantly influence the mean charge. Other preoperative factors found to be predictive of increased hospital charge were (1) the date of operation, (2) previous thoracic surgery, (3) failure to thrive, (4) associated major extra cardiac anomalies, (5) oxygen requirement, and (6) distance from home to hospital. A primary diagnosis of atrial septal defect decreased the mean postoperative length of stay by 3.1 days. Other preoperative conditions that increased the mean postoperative length of stay were: (1) Major extracardiac malformation, (2) failure to thrive, and (3) oxygen requirement. Researchers generated charge and length of stay equations to assist with the prediction of resource utilization in this patient population. Results indicated that the repair of cardiac malformations at an earlier age should not be limited since age at operation alone did not influence the hospital charge or length of stay and that the majority of children with congenital heart disease can expect a lifetime of productivity.

143

What is the Cost of a Handicapped Child in Sweden?

Form: Journal article.

Author: Svenningsen, N.W.

Source: *International Journal of Technology Assessment in Health Care*.

7(Supplement 1):151-154, 1991.

Abstract: According to Swedish statistical data, in 1981 about 7 percent of the total Swedish population, or every fifteenth child, had some degree of disability and 1.3 percent had severe disabilities, often related to preterm birth. In assessing the negative and positive consequences of a specific neonatal treatment policy, both with regard to saving lives (cost effectiveness) and to the achievement of the lowest possible incidence of disabilities among survivors (cost efficiency), it is necessary to include the family and society in a purely economic (cost benefit) evaluation. Cost estimates should cover the costs of neonatal intensive care, the long-term medical care costs, the socioeconomic costs of care of children with disabilities, and the intangible costs and benefits (e.g., the effects on the child and family). Items to consider in estimating the costs of a child with disabilities for society include (1) the direct costs for different levels of disabilities at different levels of care; (2) the indirect costs to members of the family; and (3) the intangible costs to parents, other family members, medical personnel, and social workers. Currently in Sweden, most of the direct costs of child rehabilitation efforts relate to outpatient clinic care and home care. A 1977 study assessed the costs of neonatal intensive care in a 1-year Swedish neonatal care population. At that time, estimates showed that the average annual cost for rehabilitative care of a child with mild, moderate, or severe disabilities was 5-11 times higher than the average cost per patient for neonatal treatment in the hospital during

that year. Another study in the 1970's showed that, of every 40 lives saved among preterm infants in one region of Sweden, one infant would acquire some degree of cerebral palsy.
1 table, 9 references.



Birth Defects, Mental Retardation, and Chronic Conditions

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R144

Health Insurance and Utilization of Medical Care for Chronically Ill Children With Special Needs: Health of Our Nation's Children, United States, 1988.

Form: Journal article.

Author: Aday, L.A.

Source: *Advance Data.*

(215):1-8, August 18, 1992.

R145

Screening for Hearing Impairment in the Newborn (Editorial).

Form: Journal article.

Author: Anon.

Source: *Lancet.* 2(8521-8522):1429-1430, December 20-27, 1986.

R146

Hepatitis B Screening and Immunization for People With a Mental Handicap in Southampton: Costs and Benefits.

Form: Journal article.

Author: Arulrajan, A.E.; Tyrie, C.M.; Phillips, K.; O'Connell, S.

Source: *Journal of Intellectual Disability Research.* 36(Part 3):259-264, June 1992.

R147

Amniostat-FLM: An Initial Clinical Trial With Both Vaginal Pool and Amniocentesis Samples.

Form: Journal article.

Author: Benoit, J.; Merrill, S.; Rundell, C.; Meeker, C.I.

Source: *American Journal of Obstetrics and Gynecology.* 154(1):65-68, January 1986.

R148

Health Impact of Measles Vaccination in the United States.

Form: Journal article.

Author: Bloch, A.B.; Orenstein, W.A.; Stetler, H.C.; Wassilak, S.G.; Amler, R.W.; Bart, K.J.; Kirby, C.D.; Hinman, A.R.

Source: *Pediatrics.* 76(4):524-532, October 1985.

R149

Prevention of Rhesus Isoimmunization (Editorial).

Form: Journal article.

Author: Bowman, J.M.

Source: *American Journal of Obstetrics and Gynecology.* 148(8):1151-1152, April 15, 1984.

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R150

Federal Assistance for Mental Retardation and Developmental Disabilities II: The Modern Era.

Form: Journal article.

Author: Braddock, D.

Source: *Mental Retardation*. 24(4):209-218, August 1986.

R151

Efficacy and Economy of Comprehensive Dental Care for Handicapped Children.

Form: Journal article.

Author: Brown, J.P.

Source: *International Dental Journal*. 30(1):14-27, March 1980.

R152

Maternal Serum Alpha-Fetoprotein Screening: Benefits, Risks, and Costs.

Form: Journal article.

Author: Campbell, T.L.

Source: *Journal of Family Practice*. 25(5):461-467, November 1987.

R153

Benefits and Costs of Prenatal Diagnosis (Editorial).

Form: Journal article.

Author: Chamberlain, J.

Source: *Revue d Epidemiologie et de Sante Publique*. 32(2):85-87, 1984.

R154

Is Universal Screening for Hepatitis B Infection Warranted in All Prenatal Populations?

Form: Journal article.

Author: Christian, S.S.; Duff, P.

Source: *Obstetrics and Gynecology*. 74(2):259-261, August 1989.

R155

Antenatal Screening for Down's Syndrome (Editorial).

Form: Journal article.

Author: Clift, T.J.

Source: *British Medical Journal*. 305(6856):768, September 26, 1992.

R156

Diagnostic Values of Concurrent Nonstress Testing, Amniotic Fluid Measurement, and Doppler Velocimetry in Screening a General High-risk Population.

Form: Journal article.

Author: Devoe, L.D.; Gardner, P.; Dear, C.; Castillo, R.A.

Source: *American Journal of Obstetrics and Gynecology*. 163(3):1040-1048, September 1990.

R157

Intrapartum Hepatitis B Screening in a Low-risk Population.

Form: Journal article.

Author: Ernest, J.M.; Givner, L.B.; Pool, R.

Source: *American Journal of Obstetrics and Gynecology*. 163(3):978-980, September 1990.

R158

Newborn Screening for Cystic Fibrosis.

Form: Journal article.

Corporate Author: Cystic Fibrosis Neonatal Screening Study Group.

Author: Farrell, P.M.; Mischler, E.H.

Source: *Advances in Pediatrics.*

39:35-70, 1992.

R159

Maternal Serum Alpha-Fetoprotein Screening for Neural Tube Defects.

Form: Journal article.

Author: Fuhrmann, W.; Weitzel, H.K.

Source: *Human Genetics.* 69(1):47-61, 1985.

R160

Is Antenatal Screening for Syphilis Worth While?

Form: Journal article.

Author: Garland, S.M.; Kelly, V.N.

Source: *Medical Journal of Australia.* 151(7):368, 370, 372, October 2, 1989.

R161

Feasibility of Screening All Neonates for Hearing Loss.

Form: Journal article.

Author: Hall, D.; Garner, J.

Source: *Archives of Disease in Childhood.* 63(6):652-653, June 1988.

R162

Evaluation of New Services: Possibilities for Preventing Congenital Toxoplasmosis.

Form: Journal article.

Author: Henderson, J.B.; Beattie, C.P.; Hale, E.G.; Wright, T.

Source: *International Journal of*

Epidemiology. 13(1):65-72, March 1984.

R163

Reduction of RH (D) Sensitization: A Cost-effective Analysis (Editorial).

Form: Journal article.

Author: Hensleigh, P.A.

Source: *Obstetrics and Gynecology.*

61(4):537-538, April 1983.

R164

Chronically Ill Children in America.

Form: Journal article.

Author: Hobbs, N.; Perrin, J.M.;

Ireys, H.T.; Moynihan, L.C.; Shayne, M.W.

Source: *Rehabilitation Literature.*

45(7-8):206-213, July-August 1984.

R165

Health Maintenance Organizations vs. Indemnity Insurance for Children With Chronic Illness: Trading Gaps in Coverage.

Form: Journal article.

Author: Horwitz, S.M.; Stein, R.

Source: *American Journal of Diseases of Children.* 144(5):581-586, May 1990.

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R166

Effects of Recent Research on Recommendations for Periconceptional Folate Supplement Use.

Form: Journal article.

Author: Mills, J.L.; Raymond, E.

Source: *Annals of the New York Academy of Sciences.* 678:137-145, March 15, 1993.

R167

Cost-benefit Analysis of a Thalassemia Disease Prevention Program.

Form: Journal article.

Author: Ostrowsky, J.T.; Lippman, A.; Scriver, C.R.

Source: *American Journal of Public Health.* 75(7):732-736, July 1985.

R168

State-Sponsored Genetic Services in Maryland.

Form: Journal article.

Author: Panny, S.R.; Bernhardt, B.A.

Source: *Maryland Medical Journal.* 38(11):925-932, November 1989.

R169

Costs and Benefits of Providing Early Intervention to Very Young, Severely Hearing-impaired Children in the United States: The Conceptual Outline of a Longitudinal Research Study and Some Preliminary Findings.

Form: Journal article.

Author: Rittenhouse, R.K.; White, K.; Lowitzer, C.; Shisler, L.

Source: *British Journal of Disorders of Communication.* 25(2):195-208, August 1990.

R170

Benefit-Cost Aspects of Rubella Immunization.

Form: Journal article.

Author: Schoenbaum, S.C.

Source: *Reviews of Infectious Diseases.* 7(Supplement 1):S210-S211, March-April 1985.

R171

Thalassemia Disease Prevention: Genetic Medicine Applied.

Form: Journal article.

Author: Scriver, C.R.; Bardanis, M.; Cartier, L.; Clow, C.L.; Lancaster, G.A.; Ostrowsky, J.T.

Source: *American Journal of Human Genetics.* 36(5):1024-1038, September 1994.

R172

Feasibility of Chemical Screening of Urine for Neuroblastoma Case Finding in Infancy in Quebec.

Form: Journal article.

Author: Scriver, C.R.; Gregory, D.; Bernstein, M.; Clow, C.L.; Weisdorf, T.; Dougherty, G.E.; Auray-Blais, C.; Giguere, R.; Lemieux, B.; Laberge, C.

Source: *Canadian Medical Association Journal.* 136(9):952-956, May 1, 1987.

R173

Maternal Serum Alpha-Fetoprotein Screening for Down Syndrome: Economic Considerations.

Form: Journal article.

Author: Swint, J.M.; Greenberg, F.

Source: *American Journal of Medical Genetics.* 31(1):231-245, September 1988.

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Assessing the Diagnostic Accuracy and Efficacy of Selected Antepartum Fetal Surveillance Techniques.

Form: Journal article.

Author: Thacker, S.B.; Berkelman, R.L.

Source: *Obstetrical and Gynecological Survey.* 41(3):121-141, March 1986.

R175

Cost Effectiveness of Antenatal Hepatitis B Screening and Vaccination of Infants.

Form: Journal article.

Author: Thomas, I.L.

Source: *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 30(4):331-335, November 1990.

R176

Cost-effectiveness Analysis of Prenatal Screening and Vaccination Against Hepatitis B Virus: The Case of Belgium.

Form: Journal article.

Author: Tormans, G.; Van Damme, P.;

Carrin, G.; Clara, R.; Eylenbosch, W.

Source: *Social Science and Medicine.* 37(2):173-181, July 1993.

R177

Antenatal Anti-D Immunoglobulin (Editorial Response).

Form: Journal article.

Author: Tovey, L.

Source: *Lancet.* 2(8355):918, October 15, 1983.

R178

Containing Costs in the Treatment of Congenital Heart Disease.

Form: Journal article.

Author: Waldman, J.D.; George, L.; Lamberti, J.J.; Lodge, F.A.; Pappelbaum, S.J.; Turner, S.W.; Mathewson, J.W.; Kirkpatrick, S.E.

Source: *Western Journal of Medicine.* 141(1):123-126, July 1984.

R179

Costs and Results of Cardiac Operations in Infants Less Than 4 Months Old: Are They Worthwhile?

Form: Journal article.

Author: Watson, D.C.; Bradley, L.M.; Midgley, F.M.; Scott, L.P.

Source: *Journal of Thoracic and Cardiovascular Surgery.* 91(5):667-673, May 1986.

R180

Antepartum Rh Immune Globulin.

Form: Journal article.

Author: Wible-Kant, J.; Beer, A.E.

Source: *Clinics in Perinatology.* 10(2):343-355, June 1983.

Birth Defects, Mental Retardation, and Chronic Conditions

R181

Newborn Hypothyroid Screening: The Private Sector.

Form: Journal article.

Author: Wilson, D.P.; Coldwell, J.G.

Source: *American Journal of Diseases of Children.* 139(7):662-663, July 1985.

R182

Effects of Cost-Sharing on Users of a State's Health Service Program.

Form: Journal article.

Author: Wolfson, J.; Kapadia, A.S.; Decker, M.; Sear, A.M.; Roht, L.H.

Source: *Medical Care.* 20(12):1178-1187, December 1982.

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Management of Women Referred to Early Pregnancy Assessment Unit: Care and Cost Effectiveness.

Form: Journal article.

Author: Bigrigg, M.A.; Read, M.D.

Source: *British Medical Journal*.

302(6776):577-579, March 9, 1991.

Abstract: British researchers assessed the efficiency of a district general hospital's early pregnancy assessment unit in the care of women with bleeding or pain in early pregnancy. Subjects consisted of 1141 women referred with bleeding or pain in early pregnancy during the first year of the unit's operation and in the six months prior to its introduction. The length of hospital stay required for diagnosis and treatment served as the main outcome measure. Results indicate that before the unit was established, the mean admission time was one and a half days for women who required no treatment and three days in women requiring evacuation of the uterus. These times were reduced to two hours as an outpatient and one day respectively for most women after the unit was established. Between 318 and 505 women were estimated to have been saved from unnecessary admission, and 233 had their stay reduced; the associated saving was between 95,000 pounds and 120,000 pounds in one year. The early pregnancy assessment unit improved the quality of care and also produced considerable savings in financial and staff resources. 2 tables, 1 figure, 4 references.

184

Obstetric Care in the Netherlands: Manpower Substitution and Differential Costs.

Form: Journal article.

Author: Butter, I.; Lapre, R.

Source: *International Journal of Health Planning and Management*. 1(2):89-110, January-March 1986.

Abstract: Trends in the Netherlands indicate an expanded role for obstetricians in hospital-based prenatal and natal care, as well as a shift in postnatal care away from hospitals to domiciliary care. While general practitioners are present at a steadily declining share of total births, midwives continue to play a central role in supporting over 40 percent of all births and attend nearly two-thirds of all home births, which is the preferred delivery option for more than a third of childbearing women in the Netherlands. The shift of births into hospitals and postnatal care out of hospitals produces opposite effects on obstetric expenditures. The average cost of hospital births exceeds the average cost of postclinical births (women who give birth in a hospital while receiving most of their pre- and postnatal care outside) by about 2000 Dutch florins (Dfl) and that of home births by about Dfl2500. The average per diem charge of hospitalization in 1982 was Dfl530 (for mother and infant) compared to a weighted average of Dfl247 for a day of domiciliary maternity care. The cost of hospitalization for the average length of stay for obstetric patients (8.4 days) was Dfl4452, while home-based maternity care costs were estimated (for 9 days) at Dfl2228. Cost differences are primarily associated with variation in location of care and only

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secondarily associated with variation of the provider of care, underscoring the importance of contrasting styles of obstetric management and their influence on costs. In the context of these observed transitions, researchers concluded that the increasing popularity of clinical deliveries constitutes a pivotal force whose impact to date appears to have been neglected by planners and health care decision makers. 4 figures, 4 tables, 39 references.

185

Cost-Effectiveness and Obstetric Services.

Form: Journal article.

Author: Finkler, M.D.; Wirtschafter, D.D.

Source: *Medical Care*. 29(10):951-963, October 1991.

Abstract: Researchers used two risk-adjustment strategies to model the cost effectiveness of obstetric services for eight hospitals under the management of the Southern California Kaiser Permanente Medical Care Program. The study focused on what levels and mixes of obstetric service professionals were cost effective and which obstetric practice patterns were cost effective. The analytical process involved five steps: (1) Estimating all direct resource costs used in producing labor, delivery, and postpartum obstetric services; (2) developing a case-specific expected cost indicator; (3) risk adjusting observed costs for each medical center by employing the expected cost indicator; (4) selecting a risk adjusted measure of health outcomes; and (5) comparing risk adjusted costs (RAC's) to risk adjusted rate outcome (RAO's). To identify cost effective medical centers, researchers matched labor, delivery, and postpartum obstetric services (RAC's) per delivery and risk adjusted perinatal mortality rate outcome (RAO) against each other for each hospital. Risk adjusted maternal length of stay, including the

possibility of cesarian section, provided an unbiased indicator of case-mix, which was used to adjust cost per delivery. The first stage of the study involved a logistic regression of the probability of a cesarean section on a set of clinical indicators. The second stage was an ordinary least squares regression. The results suggest that cost management should focus on staff levels and mix more than on practice patterns, and care management should focus on practice patterns in relation to their influences on outcomes. 4 figures, 6 tables, 18 references.

186

Cost-Effectiveness of a Self-Care Program.

Form: Journal article.

Author: Friedman, L.H.; Oberg, B.J.; Dansby, M.M.; Sanders, J.; Leonard, S.; Davis, B.

Source: *Nursing Economics*. 6(4):173-178, 204, July-August 1988.

Abstract: Nursing professionals at a Texas hospital investigated the cost effectiveness of implementing a self-care program in a high-risk postpartum cesarean section unit. Postpartum patients who could read and speak English or Spanish were invited to participate. Program objectives included having the patient (1) perform activities related to daily self-care, (2) act as primary caregiver for her newborn to facilitate the total care concept in preparation for discharge, (3) perform and follow identified treatments and medication regimes with instructional aids and nurse assistance, and (4) effectively document all self-care and baby-care on a bedside form. Patients who participated received self-care educational materials. To evaluate cost effectiveness, researchers collected data for 4 months preintervention and 4 months postintervention. Data elements examined included percent occupancy, census, average

daily acuity, length of stay on the self-care unit, actual unit expenditures, and quality of care. Census is an indicator of the average daily number of patients on the unit. Acuity scores reflect the amount of nursing time required to adequately care for a patient. Analysis of acuity data indicated a decrease from a mean of 3.5 hours to a mean of 3.2 hours of nursing time required to care for a patient. This converts to a 9 percent savings in direct patient care hours. Monthly expenditures remained the same for salaries and services, after allowing for inflation; cost of supplies increased but the increase was attributable to the purchase of equipment unrelated to the self-care program. A review of all data elements supports implementation of self-care protocols as cost effective without compromising quality of patient care. Researchers noted no significant increase in expenditures between preintervention and postintervention. A reduction in acuity, coupled with a reduction in excessive length of stay, may indicate a cost savings when evaluated over a longer time period. 3 figures, 3 tables, 20 references.

187

Antenatal Care of Low Risk Obstetric Patients by Midwives: A Randomized Control Trial.

Form: Journal article.

Author: Giles, W.; Collins, J.; Ong, F.; MacDonald, R.

Source: *Medical Journal of Australia.*
157(3):158-161, August 3, 1992.

Abstract: To assess the practicality, acceptability to patients, and salary costs of the antenatal care of low risk obstetric patients by midwives, researchers conducted a randomized controlled trial at the antenatal clinic at Westmead Hospital, a teaching hospital of the University of Sydney (Australia). From

January 1989 until November 1990, researchers randomly allocated to one of two groups 89 women who (1) were booking for full antenatal care at Westmead Hospital; (2) were classified as low risk (i.e., had no preexisting medical or surgical conditions and, if multiparous, had previously had uncomplicated pregnancies resulting in normal vaginal deliveries); and (3) had English as their first language (these were expected to be the least easily satisfied group of patients). Group one (42 patients) had their antenatal care provided by registered midwives. Group two (41 patients) had their antenatal care provided by an obstetrician (either a visiting medical officer or staff specialist) in a routine hospital antenatal clinic. Patients in the midwives' clinic were seen by an obstetrician at their first visit to the antenatal clinic and again at 30 weeks and at 40 weeks. The midwife and obstetrician clinics each lasted 4 hours, during which an average of 60 patients were seen in the doctors' clinic and 32 were seen in the midwives' clinic. The midwives' clinic was staffed by four midwives (average salary A\$16.60 per hour). One of the doctors' clinics was staffed by three midwives, one visiting medical officer obstetrician (A\$135.50 per hour), one affiliate obstetrician (A\$88.50 per hour), a registrar (A\$23 per hour), and a resident (A\$17 per hour). The other doctors' clinic was staffed by a staff specialist obstetrician (A\$50 per hour), a registrar, three midwives, and a resident. While in the postnatal ward, patients completed a questionnaire concerning their impressions of the care they received during their pregnancy. Main outcome measures were the salary costs of each clinic and the patients' levels of satisfaction; other considerations included maternal and neonatal indicators, delivery details and analgesic requirements. The major differences found were a per patient seen/per hour salary cost of A\$101 at the midwives' clinic, A\$140 at the staff specialist's doctors' clinic, and A\$314 at the visiting medical

officer's doctors' clinic; this results in a salary cost saving at the midwives' clinic of 28 percent over the staff specialist's doctors' clinic, and 68 percent over the visiting medical officer's doctors' clinic. Compared to patients seen in the doctors' clinic, patients whose care was provided by midwives showed a higher level of confidence and a perception that they received a significantly more comprehensive amount of information. When asked which clinic they prefer to attend in the future, 98 percent of the midwives' group wished to return to the midwives' clinic and 66 percent of the doctors' group wished to change to the midwives' clinic. 4 tables, 19 references.

188

Charges for Comprehensive Obstetric Care at Teaching and Nonteaching Hospitals: A Comparison.

Form: Journal article.

Author: Gordon, G.S.; Sefcik, S.E.; Lo Gerfo, J.P.

Source: *Western Journal of Medicine.* 155(6):616-620, December 1991.

Abstract: Researchers compared total charges for prenatal and obstetric care at a major teaching hospital and faculty group practice with those at three nonteaching centers in western Washington. The patients, all of whom were enrollees of an employee-based health maintenance organization (HMO), gave birth between January 1, 1986 and December 31, 1987 (425 births). Investigators used charges as a proxy for costs and included all outpatient, inpatient, and physician charges. In a teaching hospital, average per patient outpatient/physician charges for all patients, vaginal deliveries, and cesarean deliveries were \$2,022, \$1,855, and \$2,857 respectively, while inpatient charges were \$2,630, \$2,323, and \$4,167 respectively; in a nonteaching hospital these per patient charges for

outpatients were \$1,992, \$1,770, and \$2,644 respectively while inpatient charges were \$2,538, \$1,998, and \$4,127 respectively. In the teaching system, patients were cared for by faculty and house staff; in the nonteaching settings, they received care from private physicians. All four settings are located in a similar geographic region and have similar costs for labor and for living expenses. Investigators obtained data from the health plan's computerized billing records. Researchers found no significant differences in total charges between the teaching setting (\$4,652 each for 90 births) and the nonteaching setting (\$4,530 each for 355 births) for all deliveries. In the teaching setting, vaginal deliveries were slightly more expensive (\$4,178 each for 75 births versus \$3,768 for 250 births in the nonteaching setting), as were cesarean deliveries (\$7,024 each for 15 births versus \$6,771 for 85 births), respectively. The rate of cesarean deliveries was lower in the teaching setting (17 percent versus 25 percent), partially accounting for the similarity in total charges. The length of stay was similar in the teaching hospital (3.29 versus 3.14 days). Results suggest that the academic medical center as a total system of care can provide obstetric care as cost-effectively as nonteaching systems under the constraints of prepaid care. 3 tables, 28 references.

189

Cost-effectiveness Analysis of Three Staffing Models for the Delivery of Low-risk Prenatal Care.

Form: Journal article.

Author: Graveley, E.A.; Littlefield, J.H.

Source: *American Journal of Public Health.* 82(2):180-184, February 1992.

Abstract: Researchers analyzed the comparative cost-effectiveness of three low-

risk prenatal clinic staffing models: (1) Physician-based; (2) mixed staffing (physician, nurse practitioner, registered nurses, and nurses aides); and (3) nurse-based (a clinical nurse specialist with physicians available for consultation). The three observed clinics served predominantly Hispanic clients of low socioeconomic status. Subjects were 156 women who had delivered at a county hospital over a 3-month period in 1989. Clinic one used the physician-based model, under which women saw the same physician for all their prenatal care and counseling and received a standard clinic appointment. Fees were charged on a sliding scale, according to the client's ability to pay. Clinic two used the mixed staffing model, under which each patient saw a nurse aide, a registered nurse for prenatal teaching, and the nurse practitioner and/or contract physician at each visit. All women received an 8 a.m. appointment; the charge for prenatal care and counseling was \$50 unless the woman was unable to pay. Clinic three used the nurse-based model, under which three clinical nurse specialists delivered total prenatal care, including referrals to county agencies. The client received a standard clinic appointment. Fees were charged on a sliding scale, according to the client's ability to pay. The study analyzed four broad categories of patient variables: (1) Demographic, (2) physiological, (3) satisfaction with care, and (4) cost. The Kessner Index assessed the adequacy of prenatal visits. Researchers interviewed women to assess maternal satisfaction with access to care, using a patient satisfaction tool consisting of 27 statements addressing accessibility, affordability, availability, acceptability, and accommodation. The financial officer for each clinic provided data on (1) number of staff, (2) hourly wages, (3) number of prenatal appointments made and kept, and (4) number of hours spent delivering prenatal care. Data analysis indicated no differences in outcomes for the maternal-

neonatal physiological variables, although newborn admission to the neonatal intensive care unit (NICU) approached statistical significance among the clinics: 35 percent of clinic two's clients' babies were admitted to NICU, compared to 21 percent for clinic one and 22 percent for clinic three. Clinic three (staffed by clinical nurse specialists) had the greatest client satisfaction and the lowest cost per visit. 6 tables, 18 references.

190

Safe Motherhood Initiative: Proposals for Action.

Form: Paper.

Author: Herz, B.; Measham, A.R.

Source: Washington, DC, World Bank, 52 p., May 1987.

Availability: World Bank, 1818 H Street, NW., Washington, DC 20433.

Abstract: In developing countries, maternal mortality is often the leading cause of death of women of childbearing age. A total of 500,000 women worldwide each year die of pregnancy-related complications; 99 percent of these deaths occur in developing countries. The risks are generally greater for (1) very young women and those over age 35; (2) women in their first pregnancy or after their fourth; (3) women with preexisting health conditions; (4) those who are poor, malnourished, and uneducated; and (5) women who live in rural areas without access to health care. Seventy-five percent of maternal mortality results from direct obstetric deaths, especially from hemorrhage, sepsis, toxemia, obstructed labor, and illegal or primitive abortion. Improving the income, education, health, and nutritional status of women of childbearing age could significantly improve maternal mortality rates. Access to family planning information and services could ultimately prevent 25-40 percent of maternal

mortality. There are three major factors to consider in any plan addressing this problem: (1) Prevention of complications, (2) routine care, and (3) backup measures for high-risk and emergency cases. Screening techniques could identify the high-risk population among pregnant women and allow concentration of resources where they are most needed. A strategy to provide these three elements should use a 3-pronged approach: (1) Stronger community-based care including screening and referral methods, provision of prenatal care, and access to family planning services; (2) stronger referral facilities, including hospitals and health centers to provide care for complicated deliveries and obstetrical emergencies, and clinical and surgical methods of family planning; and (3) an alarm and transport system to transfer women with high-risk pregnancies from communities to referral facilities. Of two cost models presented here to implement such an approach, the second (involving a \$1 per capita per annum expenditure rather than a \$2 one) is more cost effective. The costs associated with administering a safe motherhood initiative are staff (\$115,000), transportation (\$25,000), inservice training and supervision (\$30,000), equipment and supplies (\$60,000), health education (\$10,000), and monitoring and evaluation (\$10,000). 11 tables, 54 references.

191

Certified Nurse-Midwives and Physicians: Perinatal Care Charges.

Form: Journal article.

Author: Krumlauf, J.; Oakley, D.; Mayes, F.; Wranesh, B.; Springer, N.; Burke, M.

Source: *Nursing Economics.* 6(1):27-30, 46, January-February 1988.

Abstract: To examine costs in health care provision, researchers reviewed billing charges for perinatal care by physicians (MD's) and certified nurse midwives (CNM's).

Investigators compared hospital and professional fee charges for a matched sample of 29 CNM and 29 MD clients and their babies who received care at a Michigan hospital. Researchers designed a data collection form to record data extracted retrospectively from hospital billing records, and obtained billing data from the obstetric, pediatric, anesthesia, radiology, and pathology service departments for professional fee charges. Collection of billing data began 4-5 months after delivery and covered the period from the start of care through 2 months after delivery for mothers and 2 weeks after birth for the babies. The CNM and MD groups were similar demographically. Analysis of charges showed that the mean total charges to MD clients were higher, with mean charges of \$4,117 to MD clients and \$3,569 to CNM clients. This difference approached statistical significance. Between-group analyses of total charges showed that the charges to CNM and MD clients were essentially the same for professional services (\$984 versus \$994, respectively) but significantly different for hospital services (\$2,585 versus \$3,123, respectively). Regarding bill charges related to labor, delivery, and immediate postpartum care, the average for the CNM group was \$1,480; for the MD group, \$1,882. The difference could not be accounted for by length

of stay. Results indicate that MD's tended to use services or delivery locations with higher associated charges. 5 tables, 7 references.

192

Effect of Prenatal and Infancy Nurse Home Visitation on Government Spending.

Form: Journal article.

Author: Olds, D.L.; Henderson, C.R.; Phelps, C.; Kitzman, H.; Hanks, C.

Source: *Medical Care*. 31(2):155-174, February 1993.

Abstract: Researchers analyzed the net cost of a prenatal and infancy nurse home visitation program from the perspective of government spending to determine whether improvements in maternal and child health translated into government savings (averted expenditures for other government services and increased tax revenues from participation in the workforce). Between April 1978 and September 1980, a randomized trial of a prenatal and infancy nurse home visitation program found that, in contrast to comparison services, home visitation improved a wide range of maternal and child health outcomes among poor, unmarried, and teenaged women bearing first children in a semirural county in upstate New York. The trial had as its goals (1) improving the outcomes of pregnancy; (2) improving the quality of care that parents provide their children (and the children's subsequent health and development); and (3) improving the mother's personal life-course development through completing educations, finding work, and planning future pregnancies. As part of the trial, researchers interviewed 500 primiparous women through a no-cost antepartum clinic and enrolled 400 women before their thirtieth week of pregnancy. There were four treatment conditions: (1) Screening of infants at ages 1 and 2 years for developmental and sensory problems, with

referral to specialists (treatment one); (2) free transportation to regular prenatal and well-child care clinics and to screening and referral (treatment two); (3) visitation by a nurse home visitor during pregnancy and the benefits given to the first two groups (treatment three); or (4) the same benefits as the third group and continued nurse visitation until the children were age 2 years (treatment four). Data came from medical and social service reviews and periodic maternal interviews addressing (1) family structure, (2) psychological characteristics, (3) health conditions, (4) health habits, (5) availability of informal support, and (6) childhood history. A cost benefit analysis compared the most relevant government costs for families in the nurse visitation program and those given the comparison services. Government costs included (1) nurse salaries (\$1,049 for treatment three, \$3,277 for treatment four, and zero for comparison services); (2) costs of services to which nurses linked families (e.g., Special Supplemental Food Program for Women, Infants and Children (WIC)) (\$934 for treatment three, \$747 for treatment four, and \$808 for comparison services); and (3) costs of taxicab service (\$30 for treatment three, \$32 for treatment four, and \$13 for comparison services). Government cost benefits were presumed to accrue through improved maternal and child functioning (i.e., reduced costs to Aid to Families With Dependent Children (AFDC), Medicaid, Food Stamps, and Child Protective Services), reduction in subsequent pregnancy among low-income women, and tax revenues generated by women's working. Data analysis indicated that for low-income families, the cost of the program was recovered and a dividend accrued of \$180 per family. The net cost of the program for the sample as a whole was \$1,582 per family. An appendix provides details of cost calculations. 1 figure, 4 tables, 32 references.

193

Cost-Effectiveness Analysis of Prenatal Care Delivery.

Form: Journal article.

Author: Seiner, K.; Lairson, D.R.

Source: *Evaluation and the Health Professions.* 8(1):93-108, March 1985.

Abstract: Researchers performed a cost-effectiveness analysis (CEA) to evaluate the relative efficiency of three alternative prenatal care programs in rural, low-income areas of Texas. Investigators compared both the actual cost per visit and the predicted capacity cost per visit, the latter determining which model type has the potential to be most effective. The study retroactively examined costs and encounter data for the three clinics for 1981. Estimating the costs of care included enumeration, measurement, and valuation of each clinic's capital and operating costs, both fixed and variable; separating maternity from medical costs; and allocating maternity to prenatal care. Other specific costs determined included those related to manpower, utilities and maintenance, medical and office supply, janitorial needs, consultation, employee travel, depreciation of equipment and furniture, miscellaneous costs (insurance, communication, data processing, equipment repair, recruitment), and administrative headquarters costs. Researchers derived the cost-effectiveness (CE) ratio by dividing the sum of the prenatal costs (\$73,186; \$14,237; and \$82,770; respectively) by the total number of prenatal visits (2,494; 432; and 2,460; respectively) during the year. The lowest average cost was \$29.34 at the Raymondville clinic; average costs at the other two clinics were \$32.96 for Littlefield, and \$33.65 for Plainview. The Raymondville clinic had the lowest cost per visit when using both actual and adjusted capacity data. After considering specific criteria, such as (1) type of routine and ancillary services provided, (2) utilization

of space, (3) input mix of personnel, and (4) quality of care rendered, researchers attributed cost per visit differences primarily to the mix of medical personnel. Specifically, the use of certified nurse midwives in conjunction with physician backup proved more cost-effective than salaried physicians alone. Figures are not given for the cost-effectiveness of use of nurse midwives and physician backup versus salaried physicians alone. 3 tables, 10 references.

194

Economic Evaluation of Daycare in the Management of Hypertension in Pregnancy.

Form: Journal article.

Author: Twaddle, S.; Harper, V.

Source: *British Journal of Obstetrics and Gynaecology.* 99(6):459-463, June 1992.

Abstract: In 1989, researchers in Scotland evaluated the efficacy of day care in the management of hypertension in pregnancy as compared to inpatient management with prior domiciliary visits. Researchers hypothesized that, since the incidence and outcomes of hypertensive pregnancies were similar in two maternity teaching hospitals, it would be possible to study the different modes of management for mild hypertension for cost minimization. Researchers recruited 100 consecutive patients with hypertension from the Glasgow Royal Maternity Hospital daycare unit and 100 consecutive inpatients from both Glasgow Royal Maternity Hospital and Aberdeen Maternity Hospital. Additionally, the study included 100 women seen by the domiciliary midwife service in Aberdeen Maternity Hospital during the time taken to recruit the 100 inpatients. Data came from each subject's case records and included demographics, obstetric and medical history, history of hypertension in the current pregnancy, and all hypertensive-related resource use and maternal and fetal outcome.

Researchers calculated actual costs for each element of hypertension related care; however, they calculated a single set of unit costs so that any differences in costs were a result of different resource use and not different hospital operating characteristics. Via a structured interview, researchers elicited women's views on the care they received, their preferences for day care or inpatient care, and costs they incurred in terms of loss of earnings, out of pocket expenses, and activity disruption. Researchers measured (1) pregnancy outcomes in terms of maternal hypertensive complications, (2) gestation at delivery, (3) mode of delivery, (4) birthweight, (5) Apgar scores, (6) admission rates, and (7) length of admission to special care baby unit. Data analysis found no significant difference in any of the measured pregnancy outcomes between the two hospitals. Domiciliary midwife visits and daycare were very popular with the patients. Day care management of hypertension in pregnancy was more cost efficient than inpatient care with prior domiciliary visits for most women, but less efficient for women with transient or previous hypertension. An appendix offers cost calculations for different systems of care. 10 references.

195

Comparative Analysis of Newborn Outcome in a Hospital-based Birthing Center.

Form: Journal article.

Author: Waskerwitz, S.; Fournier, L.; Jones, P.; Meier, W.

Source: *Clinical Pediatrics*. 24(5):273-277, May 1985.

Abstract: Researchers reviewed medical records of babies born in a hospital-based birthing center to determine whether a birthing center alternative to traditional hospital care of the newborn is safe and cost-effective.

Between 1979-1981, researchers at Rush-Presbyterian-St. Luke's Medical Center (Chicago, Illinois) compared a cohort of 123 hospital-based birthing center low-risk deliveries with 100 control low-risk deliveries born during the same period in the medical center's traditional labor and delivery setting. The center, which is staffed by attending physicians and certified nurse midwives, provides low-risk, full-term mothers with a simulated home environment, with family members present, for labor, delivery, and immediate neonatal care. To be eligible to select an alternate birthing site, couples must (1) have a maternal age between 19 and 35, (2) be part of an intact family, (3) attend birthing center classes, (4) have an absence of risk factors (using the Hollister classification as a basis), (5) have at least 12 years formal education, and (6) have agreement from the obstetrician and prospective pediatrician to participate in the process. Parents of babies in the control group were matched for the same characteristics. Analysis of the babies' status at birth, 24 hours, and 72 hours revealed no difference in immediate morbidity. Morbidity was assessed based on (1) respiratory distress, (2) cyanosis, (3) apnea, (4) abdominal distention, (5) vomiting, (6) arrhythmias, (7) murmurs, (8) convulsions, (9) tremors, (10) hypotonia, (11) jaundice, (12) plethora, and (13) congenital malformation. Classification of immediate morbidity was determined need and rapidity of treatment. Cost of hospitalization was reduced by an average of \$340 per baby, mainly due to the length of time the mother spent hospitalized (average 4.21 days) or in the birthing center (average 1.28 days). 4 tables, 9 references.

196

Comparative Costs of a Cooperative Care Program Versus Inpatient Hospital Care for Obstetric Patients.

Form: Journal article.

Author: Woods, J.R.; Saywell, R.M.; Benson, J.T.

Source: *Medical Care.* 26(6):596-606, June 1988.

Abstract: Researchers compared the cost of obstetric care delivered in a cooperative care unit with the cost for similar patients treated in a traditional inpatient maternity unit between March 1985 and February 1986. Researchers sought to determine (1) the average hospital cost per patient for obstetric care delivered in a cooperative care setting versus a hospital inpatient setting; (2) whether, or to what extent, there is a cost difference between the two types of care; and (3) the sources of potential cost savings. The cooperative care unit was located in an adjoining hotel; eligible well mothers and their newborns stayed in the hotel room and relied on care partners for most of their routine care. The study sample contained 1,683 consecutive obstetric patients representing 23 distinct ICD-9-CM diagnoses (576 cooperative care patients and 1,107 hospital inpatients). Cooperative care unit patients were (1) women who have had an eventful normal delivery or an uncomplicated Cesarean section; (2) did not require laboratory tests, intravenous (IV) care, or administration of narcotics; and (3) were self-selected for co-op care. Researchers calculated the average hospital cost per case by multiplying an adjusted ratio of department cost to charges (direct and indirect costs per hospital service unit; e.g., labor and delivery, anesthesiology, and laboratory) by each patient's recorded charge. The analysis indicates that cooperative care patients had significantly lower total hospital costs (\$1,368.12 versus \$1,508.11). The cost

savings persisted even when researchers controlled for case severity. The only exception was for obstetric patients requiring intra-abdominal surgery (i.e., delivery by Cesarean section or delivery followed by a related open surgery procedure such as repair of current obstetric laceration of bladder and urethra, repair of umbilical hernia, or destruction or occlusion of fallopian tubes) (\$2,041.05 for co-op care per person versus \$1,952.73 for hospital care per person). Compared with hospitalization patients, co-op care patients (1) who had a normal delivery had \$131.69 less costs per case, (2) who had a complex delivery had \$94.96 less costs per case, and (3) who had surgery had \$88.32 higher costs per case. For fiscal year 1986, hospital cost savings for the 576 patients who used the cooperative care unit totaled \$80,640, or approximately \$105,000 in total patient charges. The majority of the savings came from a reduction in routine nursing services that is directly attributable to the use of care partners in the cooperative care unit. 7 tables, 9 references.

Maternal Health

Screening for Maternal Infections and Conditions

197

Cost Implications of Routine Antenatal Administration of Rh Immune Globulin.

Form: Journal article.

Author: Adams, M.M.; Marks, J.S.; Koplan, J.P.

Source: *American Journal of Obstetrics and Gynecology*. 149(6):633-638, July 15, 1984.

Abstract: Researchers examined the cost implications of a program of routine antenatal administration of Rh immune globulin for primiparous women. Using existing clinical and demographic data to identify the principal variables that contribute to an assessment of the benefits, risks, and costs, they determined which variables are most important in evaluating this program. They also compared the alternative policy of routine antepartum and postpartum administration of Rh immune globulin for primiparous women with the policy of only postpartum administration. The risks of maternal antepartum sensitization were the number of subsequent pregnancies in which Rh hemolytic disease of the newborn occurs. The benefits of an antepartum Rh immune globulin program were the incidence, cost, and morbidity of cases of Rh hemolytic disease of the newborn that could be prevented. The cost of the program was the cost of antepartum administration of Rh immune globulin. Researchers used decision analysis on the hypothetical experience of a cohort of 10,000 Rh-negative primiparous women through their second delivery. To account for racial differences in the frequency of Rh-incompatible pregnancies, researchers performed separate analyses for white, black, and Asian women. The probabilities assigned to the branches of the decision tree were based

on published data; when several probabilities were plausible, sensitivity analyses were performed. The decision node was for antepartum administration of Rh immune globulin at 28 weeks gestation in a mean dose of 300 grams to all Rh-negative primiparous women or no antepartum program. The chance nodes included (1) the probability of Rh incompatibility, which was 0.6 for white, 0.7 for black, and 0.95 for Asian; (2) since previous studies estimated that 0.3 to 1.9 percent of unsensitized women become sensitized during the third trimester, researchers selected 0.005, 0.010, and 0.016 as the range of probabilities for sensitivity analysis for antepartum sensitization; (3) the probabilities of first delivery with no maternal sensitization, 1.0 assuming that all sensitized Rh-negative women with Rh-positive infants would receive Rh immune globulin postpartum; (4) the probability of first delivery with maternal sensitization, 1.0 assuming that all pregnant women who were sensitized before birth did not receive Rh immune globulin postpartum; (5) since previous studies estimated that 59 to 76 percent of white and Asian women and 50 to 73 percent of black women with one previous delivery expected to have future births, researchers used 0.76, 0.65, and 0.59 for white and Asian women and 0.73, 0.60, and 0.50 for black women as sensitivity analyses for the probabilities of primiparous women having a second delivery; and (6) the probability of Rh hemolytic disease of the newborn at second delivery, 0.40 for no disease, 0.20 for mild disease, and 0.40 for moderate/severe disease. When the hospital, pediatrician, and obstetrician charges were combined, the estimated excess charges per case were \$1,170 for mild cases and \$6,454 for moderate/severe cases. The estimated

charge for antenatal Rh immune globulin was \$40 including administration, with a cost range of \$30 to \$70. The number of births of second-order infants with Rh hemolytic disease of the newborn and the costs per case averted by an antepartum program for 10,000 Rh-negative primiparous women were 14 white infants and \$28,571 per case, 18 black infants and \$22,222 per case, and 35 Asian infants and \$11,429 per case. The cost of the antepartum program was \$400,000. The costs without the program were \$63,936 for white infants, \$84,468 for black infants, and \$156,594 for Asian infants. For all races, the costs incurred by an antepartum program were more than double the costs averted.

Sensitivity analyses showed that the most crucial factor influencing the benefits of routine antepartum administration of Rh immune globulin was the probability of this event. Another factor affecting the program's benefits was the rate of antepartum Rh sensitization among primiparous women. Results indicated that if the program were restricted to primiparous women at high risk for antepartum Rh sensitization, its benefits might exceed its costs.

198

Cost-effectiveness of Prenatal Screening and Immunization for Hepatitis B Virus.

Form: Journal article.

Author: Arevalo, J.A.; Washington, A.E.

Source: *Journal of the American Medical Association.* 259(3):365-369, January 15, 1988.

Abstract: Researchers evaluated the cost-effectiveness of screening pregnant women for hepatitis B virus (HBV) and subsequently immunizing the neonate at risk. They used a decision analysis model and data from published sources, chart review, and a Delphi survey to determine outcome

probabilities and costs. The decision tree compared two strategies: (1) To screen pregnant women for the presence of hepatitis B surface antigen (HBsAg), or (2) not to screen pregnant women. The baseline rate of HBsAg prevalence in the U.S. population was 0.2 percent. The researchers also analyzed the subgroups of population defined by the Centers for Disease Control (CDC) as high-risk groups. CDC high risk groups were defined as cases with the following prevalences: (1) National prevalence, 0.2 percent; (2) medical personnel, 1 percent; (3) CDC recommended screening groups, 4 percent; (4) very high-risk groups, 7 percent; and (5) highest risk groups, 15 percent. Neonates of mothers who are HBsAg positive should receive hepatitis B vaccine and hepatitis B immune globulin (HBIG) at birth and repeated hepatitis B vaccine at ages 1 and 6 months. The specificity and sensitivity of the HBAg immunoassay test (Auszyme) were conservatively estimated at 97.5 percent and 98 percent, respectively. The probability of neonatal transmission of HBV focused on vertical transmission varying from 12.5 percent to 90 percent, depending on the hepatitis B e antigen (HBeAg) status of the mother. Researchers calculated a transmission rate of 0.425 in the face of a true-positive HBsAg test result and performed a sensitivity analysis that varied the probabilities between 20 to 60 percent. Efficacy of immunization ranged from 85 to 95 percent; 90 percent efficacy was selected for baseline analysis. Acute hepatitis in neonates born to mothers whose serology was positive for HBsAg, negative for HBeAg, and positive for the antibody to HBeAg will develop clinical acute neonatal hepatitis at a rate of 2 to 3 percent; a median probability of 2.5 percent was selected. Death from complications of chronic liver disease for neonates was estimated at 25 percent, with the median age of death at 45 years of age. Probability of chronic liver disease varied from a low of 10 percent to a

high of 40 percent. For diagnoses in 1984 and 1985, the average number of hospitalizations for hepatocellular carcinoma, chronic active hepatitis, and cirrhosis were 4, 3, and 3 with average costs of \$7,500, \$4,500, and \$5,900, respectively. The average cost of the screening test for HBsAg was \$20 in 1985 dollars. The cost of immunization was estimated at \$50, which included three vaccines and \$15 for the initial HBIG in the hospital. The researchers also added a \$35 fee for the second visit to the physician for the second vaccine and \$20 for the HBsAg serology test at 12 to 18 months of age to confirm immunization efficacy.

Hospitalization costs for acute neonatal hepatitis were \$2,500 per hospitalization per case (1985 dollars). The average cost of total care of chronic liver disease was estimated at \$27,512 per case. The indirect costs, which included lost productivity and lost wages from development of chronic liver disease and premature death, were discounted at a rate of 4 to 6 percent using 1985 as the base year. When considering direct and indirect costs, routine screening and immunization would be cost-effective at a prevalence of 6 percent, significantly lower than the national prevalence of 0.2 percent. At an annual national birth rate of 3.5 million births, a national policy of routine screening of all pregnant women would result in an annual net savings of more than \$105 million. In the high-risk groups, as many as 140 cases of acute national hepatitis and as many as 1,400 cases of chronic liver disease would be prevented yearly per 100,000 pregnant women screened, at a net annual savings of over \$765 million.

199

Screening for HBsAg in Pregnant Women: A Cost Analysis of the Universal Screening Policy in the Province of Quebec.

Form: Journal article.

Author: Audet, A.; Delage, G.; Remis, R.S.

Source: *Canadian Journal of Public Health*. 82(3):191-195, May-June 1991.

Abstract: Canadian researchers conducted a cost analysis of a universal prenatal screening policy for hepatitis B virus infection in pregnant women. They estimated (1) the model parameters (prevalence of HBsAg among pregnant women, number of HBsAg-positive pregnant women by ethnic origin, HBIG and vaccine efficacy, immunization costs, costs of followup, cost and performance of the HBsAg test, and rate of perinatal transmission of hepatitis B virus from carrier mothers by ethnic group) and (2) cost of screening in Quebec (total cost of screening policy, cost per carrier mother detected, and cost of preventing an infant from becoming a chronic carrier). Results indicate that a universal screening policy in the province of Quebec (87,000 births per year) would cost about \$473,000 per year and the prevention of one chronic carrier, \$8,915. The cost varied greatly according to the ethnic origin of the mother and the cost of the serologic test. (Screening Asians is most cost effective and screening Caucasians is least cost effective.) Strategies to reduce the cost of the serologic test could greatly reduce the cost of this screening policy. 3 tables, 47 references.

200

Study of Various Tests to Detect Asymptomatic Urinary Tract Infections in an Obstetric Population.

Form: Journal article.

Author: Bachman, J.W.; Heise, R.H.; Naessens, J.M.; Timmerman, M.G.

Source: *Journal of the American Medical Association.* 270(16):1971-1974, October 27, 1993.

Abstract: Researchers compared rapid screening techniques for detecting asymptomatic urinary tract infections (AUTI) in pregnant women on the initial prenatal visit. They sought (1) to determine the prevalence of AUTI in the obstetric population of the Department of Obstetrics and Gynecology and Family Medicine at the Mayo Clinic in Rochester, Minnesota; (2) to compare the efficacy of urinalysis, urine dipstick testing, and Gram's staining with the results of standard urine culture; (3) to determine the patient costs for detecting positive cases; and (4) to determine whether there is a highly effective method for screening AUTI on the same day. They also sought to assess same-day testing in followup visits by (1) comparing the value of urinalysis with urine dipstick testing and (2) determining the prevalence of pyelonephritis. Subjects included 1,047 pregnant women. The criteria for the study were (1) for AUTI, a culture of 100,000 or more of a single uropathogen per milliliter; (2) for pathogens, staphylococcus coagulase-negative specimens and staphylococcus aureus were not considered uropathogens, but staphylococcus saprophyticus was acceptable; (3) for mixed cultures, mixed cultures with one predominant organism of more than 100,000 uropathogens per milliliter; and (4) patients taking antibiotics at the time of the urine study were excluded. All mixed cultures received treatment by clinicians. Urine culture, urinalysis sediment

microscopy, urine Gram's staining, and urine dipstick were performed on the initial specimen at a cost per positive test of \$25, \$15, \$15, and \$1, respectively. The cost figures assume that the screening test was done on all subjects, with subsequent urine cultures performed for a positive screening result. Of the 1,047 patients enrolled in the study, 24 had asymptomatic bacteriuria on the initial visit (prevalence 2.3 percent). When examining the components of the dipstick test, the test identified 12 of 24 patients; the sensitivity was the highest (50 percent) with high specificity (96.9 percent), when either leukocyte activity was found or nitrites were present. When using leukocyte counts greater than 10 as the criterion for a positive test, urinalysis detected only 6 of the 24 patients with positive cultures (sensitivity 25 percent, specificity 99 percent). By using the presence of bacteria on urinalysis as an alternative, sensitivity improved to 75 percent, but the positive predictive value decreased to 4.2 percent and specificity decreased to 59.7 percent. Gram's staining was the only test that simultaneously provided sensitivity and specificity values of 80 percent or greater. Gram's staining identified 22 of 24 patients with AUTI (sensitivity 91.7 percent and specificity 89.2 percent). The cost of identifying a positive culture was lowest using the urine dipstick test. The total costs of the urine dipstick test ranged from \$1,122 to \$2,147 for the study population. In followup visits, urine dipstick tests detected 19 infections and urinalysis detected three (positive predictive value, 5 percent compared with 3 percent, respectively). The use of the presence of nitrites as the criterion for a positive test with followup by urine culture resulted in total costs averaging \$127 per positive culture. When either leukocyte activity or nitrites were used as indicators for further assessment, the incremental cost per additional positive culture was \$750 due to the additional true-positive result and 29 false-positive results. Urine Gram's staining

identified almost twice the number of positive cultures as urine dipstick tests, with an incremental cost per positive culture of \$1,603 for borderline positive and \$1,790 for positive. There were large numbers of negative cultures with positive bacteria on urinalysis with costs per patient population ranging from \$15,830 (for greater than 50 leukocytes) to \$26,705 (for bacteria present or leukocytes greater than 20). The cost of doing urine cultures on all the subjects would be \$26,175 and the cultures would have detected all 24 patients with bacteriuria. Urine dipstick testing for nitrites identified half of all patients with urinary tract infections and was superior to urinalysis on followup visits. Although Gram's staining was more expensive, it was more accurate for AUTI than urinalysis or urine dipstick testing. Urinalysis was more expensive and detected fewer positive cultures. Leukocyte measurement correlated poorly with AUTI.

201

Prevention of Rh(D) Alloimmunization: A Cost-benefit Analysis.

Form: Journal article.

Author: Baskett, T.F.; Parsons, M.L.

Source: *Canadian Medical Association Journal.* 142(4):337-339, February 15, 1990.

Abstract: The Rh Programme of Nova Scotia was established in 1964 for the prevention and treatment of Rh(D) alloimmunization. The program's effectiveness in preventing the condition has been established previously in a study showing that 88 percent of expected cases were prevented. Because of increasing budget restraints in health care, researchers examined the cost-effectiveness of the program by comparing the cost of prevention (office administration fees, program staff salaries and the price of Rh immune globulin) with the cost of health care services required in addition to standard obstetric procedures and neonatal care

in 80 cases of Rh(D) alloimmunization treated from 1982 to 1986. Neonatal intensive care accounted for 80.1 percent of the additional health care expenses; an extra 512 hospital days for such care constituted 65.7 percent of the total treatment expense. The cost per case prevented (\$1,495) was 2.7 times less than the cost per case treated (\$3,986). 2 tables, 8 references.

202

Preventing Neonatal Herpes: The Value of Weekly Viral Cultures in Pregnant Women With Recurrent Genital Herpes.

Form: Journal article.

Author: Binkin, N.J.; Koplan, J.P.; Cates, W.

Source: *Journal of the American Medical Association.* 251(21):2816-2821, June 1, 1984.

Abstract: Using the technique of decision analysis, researchers determined the benefits, risks, and costs of preventing neonatal herpes infection among offspring of women with recurrent herpes. They examined two strategies: (1) Maintaining a weekly history, examination, and virology, and (2) maintaining a weekly history and examination only. The study model follows the hypothetical experience of a cohort of 3.6 million women, approximately the number of women delivering live-born offspring in 1981 in the United States. Assuming that 95 percent of the cohort would receive routine prenatal care during the last 3 months of pregnancy, the researchers estimated that 5 percent of these women (3,420,000) would report a history of recurrent genital herpes, or approximately 171,000 women eligible for screening. The first strategy involves taking weekly cultures from women with recurrent herpes from week 32 to delivery. Women who have positive results from an examination at delivery or

whose culture before delivery was positive and all women with positive results from an examination in the week before delivery would have a cesarean delivery, unless a subsequent culture was negative. Those with both a negative culture and normal examination results would be allowed to deliver vaginally. The second strategy would screen women with a history of recurrent genital herpes by history and physical examination but without viral cultures. All women with lesions at delivery would have cesarean deliveries. At the last visit before delivery, 25 percent of women with recurrent genital herpes would be shedding virus in the week before delivery; 12 percent would have no signs or symptoms and their episodes would be detectable by culture only. Thus, 22 percent of the women would have signs or symptoms while 78 percent would not (3 percent with subclinical shedding plus 75 percent with no shedding). For cost analyses, the researchers assumed that each woman would average eight cultures before delivery and each would cost \$30. They assumed that each excess hospital day for maternal complication would cost \$300. Based on the estimates in the model, 21,323 women would have symptomatic recurrent infection at delivery. Because symptoms and signs would be detected by examination, both strategies would diagnose the 18,125 at risk for transmitting the virus to offspring. An additional 2,906 women would have subclinical viral shedding at delivery, 2,470 of whom would be expected to deliver vaginally. Weekly cultures would identify 612 (24.8 percent) of the 2,470 women at risk of transmitting infection, while examination would identify none. The cost of screening alone would be \$41 million. The cost of cesarean deliveries performed for this indication and their resulting morbidity would be an additional \$20 million. Weekly viral cultures would diagnose 25 percent of women with subclinical recurrent infection at delivery. The cost per case averted would be

approximately \$1.8 million. In a cohort of 3.6 million women, researchers estimated that screening during the last 4 to 8 weeks of pregnancy would avert 11.3 neonatal deaths and 3.7 cases of severe retardation, but 3.3 women would die as a result of cesarean deliveries necessitated by culture results. The authors recommend that future screening recommendations should consider not only the number of cases averted but also the effectiveness of screening and the costs in both maternal lives and medical care dollars.

203

Maternal Age and Screening for Gestational Diabetes: A Population-Based Study.

Form: Journal article.

Author: Coustan, D.R.; Nelson, C.; Carpenter, M.W.; Carr, S.R.; Rotondo, L.; Widness, J.A.

Source: *Obstetrics and Gynecology*. 73(4):557-561, April 1989.

Abstract: The American College of Obstetricians and Gynecologists (ACOG) recommended screening for gestational diabetes, using a 50-gram, 1-hour glucose challenge (threshold for further testing 140 milligrams/dL or higher), for all pregnant women aged 30 or older and for younger women with risk factors. Since there was disagreement about the value of historic risk factors in screening, researchers from the Women and Infants Hospital of Rhode Island and Brown University evaluated the sensitivity and cost-effectiveness of various screening plans. They collected demographic and historic data on 6,214 pregnant women representing a population of universally screened individuals between July 1, 1984 and December 30, 1986 in four large obstetric practices. All four groups of obstetricians practiced universal screening using a 50-gram, 1-hour glucose challenge at 24 to 28 weeks

gestation at any time of the day. Venous blood was drawn from an antecubital vein and glucose was measured in plasma on an autoanalyzer using the hexokinase method of analysis. Over 90 percent of the patients were screened at some time prior to parturition. A screened test value of 130 mg/dL or higher required a 100 gram, 3-hour oral glucose tolerance test (GTT). Each woman was asked to fill out a questionnaire at the time of screening to obtain information on (1) medical history, (2) height and weight, (3) past obstetric history, (4) family history, (5) previous diagnosis of gestational diabetes, (6) glycosuria during pregnancy, and (7) last menstrual period. The questionnaire results were available for 98.2 percent of the individuals screened. Using the National Diabetes Data Group-ACOG criteria, 125 (2 percent) of the 6,214 pregnancies were complicated by gestational diabetes; 44 of the gestational diabetics had no risk factors. Seventy patients (56 percent) diagnosed with gestational diabetes were under the age of 30. Among these 70 pregnant women with gestational diabetes under 30, 1.9 percent had positive risk factors and 1 percent had no risk factors. Of the 125 diagnosed with gestational diabetes, 13 (10 percent) manifested screening test values of 130-139 mg/dL; their condition would have gone undetected if a threshold of 140 mg/dL had been used. If the ACOG recommendations had been followed in the study population, 44 patients (35 percent) would have gone undiagnosed. A 1-hour, 50-gram screening test is assumed to cost \$2.45 and a 3-hour, 100-gram oral GTT is assumed to cost \$11. With the current ACOG protocol, the number of cases diagnosed per 1,000 patients would be 13 (sensitivity 0.65) at a cost of \$190 per case. With universal screening, if the patient is 25 years of age or older, younger if risk factors present, with a threshold of 140 mg/dL then the number of cases diagnosed per 1,000 would be 17 (sensitivity 0.85) at a cost of \$192 per case.

With universal screening if the patient is 25 years of age or older, younger if risk factors present, with a threshold of 130 mg/dL then the number of cases diagnosed per 1,000 patients would be 19 (sensitivity 0.95) at a cost of \$215 per case. With universal screening and a threshold of 140 mg/dL then the number of cases diagnosed per 1,000 would be 18 (sensitivity 0.90) at a cost of \$222 per case. With universal screening and a threshold of 130 mg/dL then the number of cases diagnosed per 1,000 would be 20 (sensitivity 1.0) at a cost of \$249 per case. In comparing the cost and sensitivity of the various protocols, the lower the cost per case, the greater chance that cases may be missed. When comparing the least and most expensive cost per case, \$190 and \$249, there is a 31 percent increase in cost but a 35 percent increase in diagnostic sensitivity. Using the ACOG recommendations, 35 percent of gestational diabetes would go undiagnosed, with little cost savings. The authors also suggest that sensitivity could be improved by performing the screening test on fasting rather than fed subjects.

204

Cost-effectiveness of HIV Screening of Pregnant Women in Hospitals of the Paris Area.

Form: Journal article.

Author: Gales, C.L.; Moatti, J.P.

Source: *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 37(1):25-33, October 1990.

Abstract: In the context of an epidemiologic multicenter study about perinatal transmission of HIV, researchers systematically screened 7,600 pregnant women during their first prenatal visit to one of nine maternity clinics in Paris between August 1987 and July 1988. Among those screened, 2145 had already been

tested and 45 were known to be HIV positive. During the first 6 months (period 1), 5660 tests were performed and 17 pregnant women tested positive for HIV. The total cost of screening has been estimated between 720,000 and 775,000 French francs, resulting in a mean cost per infected pregnant woman of about 42,000 to 45,000 French francs. A similar calculation over the following 5 months (period 2) gave a mean cost of between 165,000 and 178,000 French francs. Since the women had to answer a short questionnaire about risk factors prior to screening, cost and effectiveness of a selective screening strategy could be simulated. The preference of systematic screening to selective screening enabled the discovery of two HIV positive cases in each period, the marginal cost, i.e., cost per extra pregnant woman found to be HIV positive was 303,320 to 327,540 French francs for period 1, and 572,240 to 619,000 French francs for period 2. Although these figures seem high, an estimation of the cost-effectiveness does not allow the researchers to conclude whether it is in society's interest to devote the funds necessary to move away from selective screening towards systematic screening. 3 tables, 2 figures, 13 references.

205

Screening Pregnant Women for HIV Antibody: Cost-Benefit Analysis.

Form: Journal article.

Author: Houshyar, A.

Source: *AIDS and Public Policy Journal*. 6(2):98-103, Summer 1991.

Abstract: Researchers developed a methodology for analyzing the costs and benefits of a human immunodeficiency virus (HIV) screening program for pregnant women in high-risk regions of the U.S. The program focuses on voluntary confidential screening

followed by voluntary educational counseling of pregnant women who test positive for HIV in New York City. Screening effectiveness is measured by (1) the number of tests and the associated costs required to identify one HIV-positive woman, (2) the number of cases prevented by the screening program followed by counseling, and (3) the cost of such a screening program per case of acquired immunodeficiency syndrome (AIDS) prevented. The costs associated with the screening program include (1) the cost of testing the population using the enzyme immunoassay (EIA) test, (2) the cost of additional testing of EIA positive women using the Western blot (Wb) test, and (3) the cost of counseling positive Wb-tested women. Researchers assumed resource costs of \$6 for an EIA series, \$50 for a Wb, and an additional \$65 in counseling costs for each pregnant woman who tests positive. The model incorporates false-positive and false-negative test results, the population seroprevalence, the transmission probability between an infected pregnant woman and her child, and the efficacy of the information on seropositivity and seronegativity in preventing the transmission of AIDS in the general population. In a population of 100,000 pregnant women, one of every 100 pregnant women is HIV positive. Screening results would detect 904 of every 1,000 (96 infected women will be told that they are not infected and 10 healthy women will be told that they are infected with HIV). The screening cost per infected woman would be \$7.95 if 100 were tested, \$6.87 if 1,000 were tested, and \$6.76 if 10,000 were tested. Total screening cost is inversely proportional to the prevalence rate. The model assumes that high-risk pregnant women are less likely to participate in the program. To measure the impact of the differences in attitude toward screening on the effectiveness of the program, researchers compared the cost per infected woman detected from the mixed population with the

corresponding cost of the homogenous model. Researchers estimate that the screening program will actually detect 129 HIV-positive pregnant women, from a pool of 142 HIV-positive individuals who come for screening at a cost of \$1,918 per case. The test will miss 13 HIV-positive cases, and 4 uninfected individuals will be falsely told that they are infected. Researchers assert that the benefits of voluntary screening of pregnant women residing in high-risk regions of the country for detection of HIV infection are (1) the birth of infected children can be prevented and (2) that an HIV-positive woman will become aware of her infection, which may help her prolong her life and prevent others from becoming infected. The costs associated with detecting an infected pregnant woman are highly dependent of the seroprevalence rate of HIV-positive women in that population. The study model can determine the minimum threshold of seropositivity that will justify screening of the population of pregnant women for HIV infectivity. 5 tables, 23 references.

206

Congenital Toxoplasmosis: To Screen or Not to Screen?

Form: Journal article.

Author: Joss, A.; Chatterton, J.; Ho-Yen, D.O.

Source: *Public Health.* 104(1):9-20, January 1990.

Abstract: Researchers performed a reanalysis of the relative costs of a congenital toxoplasmosis screening program in light of improvements in the cost efficiency of screening techniques. The question was whether a screening program would be more expensive than paying for the costs of caring for the casualties. A cost-benefit analysis published in 1984 firmly concluded that screening would not be cost beneficial.

Instead there was a proposal of a health education program to alert pregnant women to sources of infection. Since there is little evidence that the public awareness has improved, and since there is now also less public tolerance for allowing preventable disease to progress undiagnosed and unchecked in utero, the current study was undertaken. Researchers compared the present day quantifiable cost to society of the 73 cases of congenital toxoplasmosis which are estimated to occur annually in Scotland with the cost of preventing the disease by screening and treatment. Investigators examined the cost and feasibility of two methods: (1) Blood tests for all women in the second month of pregnancy, and, if susceptible, again in the fifth, seventh, and ninth months; and (2) two blood tests for all women, the first during the first trimester and a second, if necessary, in the eighth month (the timing precludes the option of termination). The analysis included advances in laboratory techniques, including enzyme-linked immunosorbent assays (ELISA) and immunosorbent agglutination assays (ISAGA). Preventable costs included the cost of inpatient care in an acute care hospital at 707 pounds per person in 1987-88. The weekly cost of institutional care in an average mental deficiency unit in Scotland was 268 pounds. The additional expense to the family of raising a handicapped child was estimated at 34 pounds per week and the cost of special education was 6,751 pounds annually. The total cost of possible outcomes of mental retardation, visual handicaps, and neonatal illnesses of congenital toxoplasmosis included 64,000 pounds for minimum outcomes, 674,000 pounds for central outcomes, and 2,637,000 pounds for maximum outcomes. The cost of screening depends on its scale and whether inhouse or commercial tests are used. For the group of women (1) who gave 3 specimens that were evaluated by commercial kits, total screening costs were 538,000 pounds, total costs of true maternal infection

were 623,000 pounds, costs of 0.02 percent false positives were 643,000 pounds, and costs of 0.36 percent false positive were 973,000 pounds; (2) who gave 3 specimens that were evaluated by inhouse kits, total screening costs were 253,500 pounds, total costs of true maternal infection were 339,000 pounds, costs of 0.02 percent false positives were 358,000 pounds, and costs of 0.36 percent false positive were 689,000 pounds; (3) who gave 2 specimens that were evaluated by commercial kits, total screening costs were 424,000 pounds, total costs of true maternal infection were 467,000 pounds, costs of 0.02 percent false positives were 487,000 pounds, and costs of 0.36 percent false positive were 817,000 pounds; and (4) who gave 2 specimens that were evaluated by inhouse kits, total screening costs were 189,500 pounds, total costs of true maternal infection were 233,000 pounds, costs of 0.02 percent false positives were 252,000 pounds, and costs of 0.36 percent false positive were 583,000 pounds. The estimated cost of a health education campaign on toxoplasmosis was 86,000 pounds. Results indicate that a cost effective prevention program should cost less than 674,000 pounds, given the infection rate of 2 to 2.5 pregnant women per thousand. Combining the diagnostic and therapeutic costs, results show that 80 percent of preventable costs could be saved by surveillance and that the cost of screening should be less than 539,000 pounds. As likely screening costs in most of the schemes considered are now less than the preventable costs, the researchers conclude that a screening program should be adopted. Tables present data on (1) cost of preventable outcomes of congenital toxoplasmosis in Scotland; (2) costs of screening and treatment for congenital toxoplasmosis; and (3) combined costs of screening, treatment, and confirming fetal infection. 4 tables, 37 references.

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Universal Prenatal Hepatitis B Testing: Is It Cost-effective?**Form:** Journal article.**Author:** Koretz, R.L.**Source:** *Obstetrics and Gynecology*. 74(5):808-814, November 1989.

Abstract: In 1984, the Immunization Practices Advisory Committee advocated hepatitis B surface antigen screening of pregnant American women having identifiable epidemiologic risk factors for being hepatitis B surface antigen carriers. In 1988, they broadened the recommendation to include all pregnant women, regardless of risk status. A researcher examines the implications of this broader policy. In two scenarios examined, the first uses a public hospital model, in which all pregnant women are tested and the expected carrier rate is 1 percent. In the second scenario, women from the general population who have no risk factors are screened, and a carrier rate of 0.1 percent is expected in this group for whom the 1988 recommendation was targeted. However, not all carriers transmit infection. Over 35 percent of pregnant carriers will be hepatitis B e antigen-positive. Researchers used the following assumptions in the cost analysis: (1) 95 percent of hepatitis B e antigen-positive pregnancies will result in infection of the neonate, (2) 20 percent of hepatitis B e antigen-negative pregnancies will result in infection of the neonate, (3) symptomatic acute hepatitis will occur in 2.5 percent of all transmitted infections, (4) 85 percent of hepatitis B e antigen-positive pregnancies will result in chronic carriers, (5) 5 percent of hepatitis B e antigen-negative pregnancies will result in chronic carriers, (6) 10 percent of carriers in the population without risk factors are hepatitis B e antigen-positive, (7) 20 percent of carriers in the population from a public hospital are hepatitis B e antigen-positive (which includes the influence

of ethnic groups with higher hepatitis B e antigen positivity rates), (8) there is 90 percent patient compliance with treatment, (9) prophylaxis is 90 percent effective, (10) the cost of hepatitis B surface antigen screening is \$20 per test, (11) the cost of initial prophylaxis is \$31.67 (\$15 hepatitis immunoglobulin (Ig) plus \$16.67 vaccine), and (12) the cost of followup is \$108.33 (\$33.33 for remaining two doses of vaccine plus \$35 for an extra visit and \$40 for postvaccination serology). The cost per case prevented was \$12,016 in the public hospital model and the cost per case prevented in a general population, with a lower carrier rate and a lower frequency of hepatitis B e antigen positivity, was 15 times as high, over \$181,556. In the cost-efficacy analysis published by Arevalo et al., the projected costs for treating acute hepatitis and chronic carriers were \$2,500 and \$23,512 respectively. In the public hospital scenario, 7 cases of acute hepatitis and 170 cases in chronic carriers were prevented. Because the direct treatment cost of these 177 patients is over \$4 million, the screening and prophylaxis cost of \$2,129,167 seems justifiable. On the other hand, the cost of hepatitis B surface antigen testing of pregnant women without risk factors is \$180,000 per case, or 15 times the cost of preventing a case in neonates of mothers with risk factors; these additional costs will substantially increase the cost of the screening program and will also prevent less clinically important hepatitis. In the general population with no risk factors scenario, to save the direct treatment costs of \$2.5 million (approximately 6 cases of acute hepatitis and 105 chronic carriers), hospitals have to spend \$20,129,167 in screening and prophylaxis. Results indicate that the major cost considerations in screening are the following: (1) The hepatitis B surface antigen carrier rate in the population to be screened (because the major cost is screening), (2) the percentage of carriers who are hepatitis B e antigen-positive, (3) the efficacy of prophylaxis in hepatitis B e antigen-negative

cases, and (4) compliance. Costs go up if the overall carrier rate or percentage of carriers who are hepatitis B e antigen-positive is lower, if compliance is poorer, or if prophylaxis is less (or even not) effective in hepatitis B e antigen-negative carrier pregnancies. 3 tables, 47 references.

208

Comparison of Prevention Strategies for Neonatal Group B Streptococcal Infection: A Population-Based Economic Analysis.

Form: Journal article.

Author: Mohle-Boetani, J.C.; Schuchat, A.; Plikaytis, B.D.; Smith, J.D.; Broome, C.V.

Source: *Journal of the American Medical Association.* 270(12):1442-1448, September 22-29, 1993.

Abstract: Researchers explored options for preventing neonatal group B streptococcal (GBS) disease by (1) developing a prevention strategy for selective intrapartum antibiotics that does not require prenatal GBS screening, (2) using decision analysis models and clinical economic analyses to compare the cost-effectiveness and cost-benefit of three strategies, and (3) using 1990 rates of neonatal GBS disease from multistate population-based active surveillance to predict the impact of these prevention strategies on disease and medical costs in the United States. They constructed a decision tree to evaluate outcomes and costs of neonatal GBS disease for three prevention strategies compared with no prevention strategy. The three strategies included (1) intrapartum antibiotics administered to colonized women with labor complications; (2) an alternative strategy in Atlanta, Georgia, that does not require screening but uses epidemiologic criteria and labor complications to target intrapartum antibiotics; and (3) maternal GBS vaccination. Researchers estimated the potential impact of

each strategy on disease and costs in the United States by using data from multistate population-based surveillance. The decision tree for the first prevention strategy included (1) screened in prenatal care; (2) colonized GBS carriers; (3) labor complications (fever of 99.5 degrees Fahrenheit, preterm labor at less than 37 weeks, or membranes ruptured for more than 12 hours previous to labor onset); (4) intrapartum antibiotics; and (5) anaphylactic reaction. The decision tree for the second strategy included (1) high-risk (teenaged or black patient); (2) labor complications (fever of 99.5 degrees Fahrenheit, preterm labor at less than 37 weeks, or rupture of membranes for more than 12 hours); (3) intrapartum antibiotics; and (4) anaphylactic reaction. The decision tree for the third strategy included (1) vaccinated, baseline coverage; (2) adverse reactions; (3) infant at greater than or equal to 34 weeks gestation; and (4) infant with protective antibody titers. Researchers analyzed direct medical costs, excluding all nonmedical costs, indirect morbidity and mortality costs, or intangible costs. They included costs for adverse reactions to antibiotics and vaccination (\$1,200 per patient), discounted at a 5 percent rate, and societal costs, which reflected costs and benefits to society as a whole rather than to specific patients, payers, or providers. The baseline cost per patient for early-onset is \$33,800 whereas late-onset is \$83,070. All three strategies had a benefit-cost ratio greater than one and positive net benefits. A threshold analysis showed that population size will affect the dollar amounts but not the cost-saving threshold; the second strategy is applicable only to the Atlanta area due to the specific demographic risk factors. Intrapartum antibiotic prophylaxis of high-risk women identified by screening could prevent approximately 3,300 cases (47 percent of neonatal disease) annually in the United States and could save approximately \$16 million in direct medical costs. Chemoprophylaxis of

high risk women identified using epidemiologic criteria could potentially be equally effective (3,200 cases prevented) and would avoid the logistical difficulties of screening. The net savings would be approximately \$66 million. Vaccinating 80 percent of pregnant women with a vaccine that prevents 80 percent of cases among infants born at or after 34 weeks of gestation would prevent approximately 4,100 neonatal cases annually with a net savings of \$131 million. Universal prenatal screening for GBS and chemoprophylaxis of colonized women with labor complications is likely to be cost-beneficial in the United States. 5 figures, 4 tables, 33 references.

209

Cost-effectiveness of Prenatal Testing for Chlamydia Trachomatis.

Form: Journal article.

Author: Nettleman, M.D.; Bell, T.A.

Source: *American Journal of Obstetrics and Gynecology*. 164(5, Part 1):1289-1294, May 1991.

Abstract: Researchers investigated the cost effectiveness of strategies for screening pregnant women for chlamydia trachomatis. Potential complications of a chlamydial infection in a pregnant woman include conjunctivitis and pneumonia in her infant, epididymitis in her sexual partner, and her own risks of postpartum endometritis or salpingitis and ectopic pregnancy. Researchers assigned dollar charges to all potential conditions and evaluated four strategies: (1) Neither test nor treat; (2) culture all pregnant women and treat if the culture is positive; (3) perform a direct antigen test in all women and treat if the result is positive; and (4) perform a direct antigen test in all women, confirm positive tests with culture, and treat only if the culture is positive. Results showed that

screening for chlamydia trachomatis was not cost effective unless the direct antigen test costs less than \$3.90 (or prevalence exceeded 8.7 percent) and the strategy involved direct antigen testing of all women and use of culture to confirm positive direct antigen. Direct antigen testing of all pregnant women would be cost effective if the test cost less than \$6.30 or the prevalence of infection exceeded 6 percent; however, the positive predictive value of the test was only 51 percent. Culturing was not cost effective until the prevalence of infection exceeded 14.8 percent. If a direct antigen test cost \$8 and culture cost \$25, the excess cost of performing a direct antigen test in all women and confirming positive results with culture would be \$2.09 per pregnant woman. Screening all pregnant women for chlamydia is not cost effective, but the excess cost is modest when direct antigen tests are used. 1 figure, 4 tables, 33 references.

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Effectiveness and Cost Benefit of a Proposed Live Cytomegalovirus Vaccine in the Prevention of Congenital Disease.

Form: Journal article.

Author: Porath, A.; McNutt, R.A.; Smiley, L.M.; Weigle, K.A.

Source: *Reviews of Infectious Diseases*. 12(1):31-40, January-February 1990.

Abstract: To evaluate the cost benefit and effectiveness of a proposed live human cytomegalovirus (CMV) vaccine in preventing a leading cause of congenital deafness and mental retardation, researchers developed a model to compare routine immunization, selective immunization of those women screened and found to be seronegative, and no immunization. Outcomes of interest were symptomatic congenital infection at birth (SCI), newborn death, and long-term neurologic sequelae. Assumptions used to

frame the decision for analysis include (1) the entire lifetime of offspring is considered the time frame for episodes of illness, (2) congenital CMV infections occur at a constant level in an endemic mode, (3) immunization will not affect herd immunity, (4) each female vaccinee is assumed to become pregnant at least once after immunization, (5) immunization of an initially seropositive mother does not modify the chance of congenital or perinatal CMV infection in her offspring, (6) vaccine strain and natural CMV strains are equally capable through reactivation of causing symptomatic congenital and perinatal infection, (7) severe vaccine reaction in the recipient may occur, and (8) increased risk of abortion due to primary maternal CMV infection. Baseline probabilities for the model were obtained from published data; when data were not available best estimates were used. Probabilities include (1) a baseline seroprevalence range of 55-70 percent for young women in the United States; (2) about 33 percent of maternal CMV infections are transmitted to the fetus; (3) the rate of primary congenital infection resulting in symptomatic illness is 10 percent (case fatality rate is 25 percent), early multisystem involvement with permanent sequelae among SCI infants is 85 percent, permanent late sequelae (usually hearing impairment) is 15 percent, and perinatally acquired CMV pneumonia is 2 percent (10 percent of which may be fatal); (4) there is an 80 percent immunogenicity of the vaccine, with a reduction in infectivity of 90 percent for both wild and vaccine-associated reactivations; and (5) the rate of vaccine-induced severe adverse effect is 1/10,000 women. Baseline cost data include (1) costs of screening for CMV antibody (\$6 per person); (2) cost of the vaccine (\$8 per person); (3) treatment of severe adverse effects (\$3,900 per person); (4) hospitalization costs for people with SCI or perinatal pneumonia (\$127,000 and \$7,200 per person, respectively); and (5) costs of special education and institutional care

for the mentally retarded, deaf, and blind (\$53,000 per year per person). Results show that the difference between routine and selective immunization, which are similar in terms of effectiveness and cost savings, is largely dependent on the potential of maternal adverse effects. The presence of human immunodeficiency virus (HIV) will preclude routine CMV immunization, and will necessitate screening for both HIV and CMV. More than half of the cases of SCI and long-term sequelae are vaccine preventable. When direct costs alone are considered, routine immunization of healthy women aged 15-25 is cost beneficial even in populations with CMV seroprevalence as high as 87 percent. In populations with 55 percent to 70 percent seroprevalence, for every 100,000 women immunized, more than 24 cases of symptomatic congenital CMV infection at birth and a similar number of cases with late sequelae (mainly deafness) would be prevented yearly. Such immunization would result in a net annual saving of \$2.5 million. Selective immunization becomes the strategy of choice when the cost of adverse effects exceeds \$60,000. The lower the seroprevalence, the greater the cost benefit, but routine immunization of healthy women age 15-25 is cost beneficial even in populations with CMV seroprevalence as high as 87 percent. 3 figures, 6 tables, 36 references.

criteria for appropriateness and cost effectiveness as a widespread screening tool. The test consisted of a serum glucose level determination in a pregnant patient 1 hour after ingesting 50 g of a glucose solution. Serum glucose values over 150 mg/dL were considered abnormal, and patients with such values were then tested with a 3-hour oral glucose tolerance test (OGTT). The researcher determined price per case detected and number of cases missed when using this test or the OGTT either on all prenatal patients or on a selected subset of patients. Cost per case detected and number of cases missed were, respectively, as follows: (1) GST for all patients; if positive, OGTT: \$684 per case detected, 5 cases missed; (2) GST only for patients with risk factors; if positive, OGTT: \$683 per case detected, 15 cases missed; (3) OGTT all patients with risk factors: \$938 per case detected, 12 cases missed; (4) OGTT all patients: \$976 per case detected, 0 cases missed; and (5) GST all patients over age 25: \$386 per case detected, 6 cases missed (three cases were missed in those screened and three in those not screened). Results support the advisability of screening all pregnant patients over age 25 for gestational diabetes with the 1-hour glucose screening test. Performing this test on that population will detect about 79 percent of the cases (99 percent confidence limit and a confidence interval of 60.6-97.3 percent) at the lowest cost per case detected. 2 tables, 17 references.

211

Screening for Gestational Diabetes: Analysis by Screening Criteria.

Form: Journal article.

Author: Reed, B.D.

Source: *Journal of Family Practice*.
19(6):751-755, December 1984.

Abstract: A researcher evaluated a previously studied glucose screening test (GST) for gestational diabetes using six screening test

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Economic Evaluation of Maternal Screening to Prevent Congenital Syphilis.

Form: Journal article.

Author: Stray-Pedersen, B.

Source: *Sexually Transmitted Diseases*.
10(4):167-172, October-December 1983.

Abstract: Researchers applied benefit-cost analysis to a model of first-trimester screening for syphilis where approximately ten new cases of early infections are identified and treated per 50,000 pregnancies. The analysis employed a model requiring the identification of a detailed list of factors and the assignment of the actual dollar values to the different items concerned. The calculations refer to Norway and were calculated in 1979 U.S. dollars with a discount rate of 7 percent, but the model can be applied for evaluation of similar preventive programs elsewhere. The procedures for the prenatal serologic screening included blood samples routinely collected at the first antenatal visit being tested by the standard tests for syphilis; the Wassermann CF test, the Venereal Disease Research Laboratory (VDRL) flocculation test, and the Meinicke flocculation test. The cost of the preventive program was \$229,016 (1979 U.S. dollars) for the 50,000 subjects and their children, which included the cost of the prenatal screening and the cost of the treatment and followup program for newly infected mothers and their children. Economic benefits of a prenatal screening program for congenital syphilis included \$660,720 in direct costs averted and \$217,200 in indirect costs averted. Total benefits of the preventive program were \$877,920; total benefits of preventing one case were \$87,792. The average cost of the serologic tests was calculated from the laboratory expenses by assessment of the cost of every item used in the performance of the tests and the share of the salaries, including benefits, of the medical and technical staff, and 40 percent to cover

administration and expenditures for electricity, fuel, and housing. The cost of the screening was estimated to be \$4.60 per participating woman, while the benefit-cost ratio was 3.8. Thus, the economic benefits were nearly four times the cost of the program. Principally, this ratio may be considered as a constant value independent of the size of the population screened. However, the total savings to society, or the overall effect of the preventive policy, may also be calculated as the net benefit (benefit minus cost), which is directly dependent on the number of participants. In Norway, with an annual pregnant population of 50,000 women, this value approximated \$650,000 yearly. However, if the indirect cost is completely excluded from the analysis, the program still gives a favorable benefit-cost ratio of 2.9 and a net benefit of \$430,000. 3 figures, 2 tables, 13 references.

213

Economic Evaluation of Preventive Programmes Against Congenital Toxoplasmosis.

Form: Journal article.

Author: Stray-Pedersen, B.; Jenum, P.

Source: *Scandinavian Journal of Infectious Diseases*. 84(Supplement):86-96, 1992.

Abstract: Researchers in Norway applied benefit-cost analyses to strategies aimed at preventing congenital toxoplasmosis: (1) Health education of pregnant women on avoiding toxoplasma infection, and (2) serological surveillance in pregnancy combined with prenatal diagnosis and chemotherapy. In Norway, approximately 40 fetuses each year are infected with congenital toxoplasmosis; of these 6 percent will die in utero or during early childhood, 16 percent will require institutional care, 15 percent will be visually handicapped and require special education, and 15 percent will be moderately retarded and

require support to live in the community. The serological surveillance in pregnancy combined with prenatal diagnosis and chemotherapy involves identification of women at risk through testing a routine blood sample for toxoplasma antibodies (IgG and IgM classes); of these, only 0.05 percent will have serological evidence of recent infection that may have been acquired during the first few weeks of gestation. These cases require prenatal diagnosis (ultrasound and amniocentesis) and the consideration of therapeutic abortion or therapy. Women who are seronegatives (85 percent) need to be repeatedly tested during the second and third trimester. Recently infected women (0.15 percent) will receive repeated prenatal examinations and therapy; their infants will receive Spiramycin therapy and will be followed with repeated clinical, ophthalmologic, radiologic, and serologic examinations. Infected infants will receive pyrimethamine, sulfadiazine, and folic acid during the first year of life. The health education program, which can reduce the risk of exposure and prevent infections in pregnancy, has minimal monetary costs (20 Norwegian krone (NOK)) because it uses already existing channels and means of information aimed at the pregnant population. The average cost per participating woman of (1) basic screenings is NOK 202; (2) second and third trimester screening is NOK 131; (3) followup, treatment, and special examination of a risk mother is NOK 4,500; (4) followup and treatment of a high-risk infant is NOK 1,300; and (5) followup and treatment of a congenitally infected infant during the first year of life is NOK 3,500. The authors conclude that the best and most rational approach, and the program which will prevent the most cases and save the most money for society, is a combination of each program. Compared with the results of any of the two strategies alone, the benefits of the combined program will increase significantly, while the

cost (NOK 165 per participating woman) will add only fractions to that of the serological screening program used alone. The benefits of the strategies are influenced by many uncertain factors such as (1) the discount rate, (2) the incidence of infection, (3) the intrauterine transmission rate, (4) the outcome of pregnancy, (5) the prognosis of the offspring, (6) the sensitivity of the screening tests and (7) the effectiveness of the program. After applying a sensitivity analysis, both programs were found to be of economic benefit to society at an incidence of maternal toxoplasmosis of 1-1.5 per 1,000. 1 figure, 4 tables, 20 references.

214

Cost-effectiveness of Intrapartum Screening and Treatment for Maternal Group B Streptococci Colonization.

Form: Journal article.

Author: Strickland, D.M.; Yeomans, E.R.; Hankins, G.

Source: *American Journal of Obstetrics and Gynecology*. 163(1, Part 1):4-8, July 1990.

Abstract: Using decision analysis methods, researchers attempted to determine what the annual costs of screening and treatment for intrapartum prophylaxis for group B streptococci infections would be in the United States and how sensitive the analysis is to changes in test accuracy and costs.

Early-onset neonatal group B streptococci infection occurs in 2 cases per 1,000 live births in the United States and is associated with a mortality rate greater than 20 percent. The annual cost of group B streptococci infection in the United States is conservatively estimated at more than \$500 million and nearly 2,000 neonatal deaths, excluding the costs of long-term neurologic handicaps. Intrapartum chemoprophylaxis with ampicillin is effective in curtailing transmission of group B

streptococci from mother to infant once identification of maternal group B streptococci colonization has occurred. Only screening tests that allow group B streptococci colonization detection in under 2 hours were used in the analysis. Five tests were evaluated: (1) The gram stain test reported by Sandy, (2) the latex test reported by Isada, (3) the latex test reported by Brady, (4) the gram stain test reported by Holls, and (5) the gram stain test reported by Feld. The screening test reported by Brady showed very high-performance results, and its use in the United States population as a whole (with a group B streptococci prevalence of 10 percent and a birth rate of 3.5 million) could avert 1,230 neonatal deaths from group B streptococci annually at a total savings of \$1,100 per neonatal death averted. In a higher-risk population such as women with preterm labor, premature rupture of the membranes, or intrapartum fever, the screening test program reported by Brady could avert 7 deaths and save an average of \$216,000 for every 10,000 women in the cohort. Findings suggest that in the United States intrapartum screening for group B streptococci is cost-effective and offers the potential to avert a significant number of neonatal deaths and postpartum infections. 1 figure, 3 tables, 25 references.

215

Cost-Effectiveness of Antepartum Prevention of Rh Immunization.

Form: Journal article.

Author: Torrance, G.W.; Zipursky, A.

Source: *Clinics in Perinatology*.

11(2):267-281, June 1984.

Abstract: To demonstrate the application of economic appraisal, researchers examine the question of whether an antepartum program of administering anti-D gamma-globulin to prevent Rh isoimmunization is sufficiently cost

effective to warrant its use. They argue that the decision to fund antepartum prophylaxis must consider circumstances in the specific area under consideration (e.g., Province of Ontario, Canada): (1) Availability and cost of anti-D gamma-globulin, (2) prevalence of the Rh factor and of Rh disease in the population, (3) pregnancy rates, (4) effectiveness of treatment of Rh disease of the newborn and the associated costs and outcomes, (5) methods and costs of finding and treating potential Rh-negative pregnant women, and (6) the relative merit of competing claims for the limited funds and resources available. Assumptions included that, according to Ontario birth statistics, 1,000 antepartum injections prevent 8 isoimmunizations, which if not prevented would subsequently cause 5.8 cases of Rh disease of the newborn leading to 0.73 more perinatal deaths (a loss of 14.2 life-years). In 1983, the net costs to the health care system in Canadian dollars were C\$2,700 per isoimmunization prevented, C\$3,700 per case of Rh disease prevented, C\$29,500 per life saved, and C\$1,500 per year of life gained and per quality-adjusted life year (QALY) gained. Restricting the program to women with homozygous Rh-positive husbands was not cost effective because the laboratory costs of determining each husband's Rh factor more than offsets the savings from the fewer antepartum treatments. Treating primiparae was more than twice as cost effective as treating multiparae; the costs per QALY gained were C\$900 and C\$2,400, respectively. These costs were substantially less than costs reported for other health care programs currently employed. Thus, in comparison with other health care expenditures, researchers conclude that a comprehensive antepartum prophylaxis program for all Rh-negative pregnant women in the Province of Ontario is sufficiently cost effective to warrant its use. 1 figure, 4 tables, 40 references.

216

Screening for Asymptomatic Bacteriuria in Pregnancy: A Decision and Cost Analysis.

Form: Journal article.

Author: Wadland, W.C.; Plante, D.A.

Source: *Journal of Family Practice.*

29(4):372-376, October 1989.

Abstract: Researchers used decision and cost analysis to compare the utility of screening pregnant women for asymptomatic bacteriuria (AB) with not screening. Data used were based on published reports and average charges for services. Cost estimates per woman included (1) dip slide, \$12; (2) urine culture, \$32; (3) amoxicillin treatments, \$5 per week; (4) followup cultures, \$108; (5) amoxicillin for the 20 percent of women who remain positive, \$1; (6) nitrofurantoin therapy for the 12 percent of women who still remain positive, \$3.01; (7) treatment for yeast vaginitis, \$1.83; and (8) inpatient hospitalization for pyelonephritis and outpatient evaluation, \$3,672.44. Researchers based costs on 1988 charges at the Medical Center Hospital of Vermont or the University Health Center, projected for the expected results of outpatient screening, possible suppressive therapy, and risks of pyelonephritis. Screening is based on the combined sensitivities and specificities of the MacConkey and CLED (cysteine-lactose-electrolyte-deficient agar) panels of the dip-slide culture. Under the baseline assumptions, the risk of pyelonephritis is estimated at 2 cases per 100 screened women versus 3.5 cases per 100 unscreened women. The anticipated cost of screening 100 women is \$9,939, compared with \$12,824 for not screening 100 women. Screening is cost effective unless (1) the cost of screening is above \$26, (2) the length of hospitalization for pyelonephritis is fewer than 2.2 days, (3) the risk of AB falls below 2 percent, (4) the risk of pyelonephritis with AB falls below 13

percent, or (5) the efficacy of treatment in preventing pyelonephritis falls below 38 percent. Based on the decision and cost analyses, there is a clear advantage to screen and treat all obstetric patients for AB to prevent pyelonephritis. 4 figures, 1 table, 13 references.

217

Cost Efficacy of Routine Screening for Diabetes in Pregnancy: 1-h Versus 2-h Specimen.

Form: Journal article.

Author: Weiner, C.P.; Fraser, M.M.; Burns, J.M.; Schnoor, D.; Herrig, J.; Whitaker, L.A.

Source: *Diabetes Care.* 9(3):255-259, May-June 1986.

Abstract: Undetected gestational diabetes mellitus (GDM) is associated with a twofold to fivefold increase in perinatal morbidity and mortality. Widespread screening of pregnant women (resulting in identification and treatment) should reduce these rates.

Researchers examined 798 women during a 13-month period of universal glucose challenge testing (GCT). A total of 2.8 percent of the population had an abnormal oral glucose tolerance test (OGTT). Thirty percent of those with an abnormal OGTT were under age 25. Researchers compared the specificity of a 1-h GCT (50-g carbohydrate load) using a threshold of either 140 or 150 mg/dL with that of a 2-h specimen using a threshold of 118 mg/dL to determine whether the cost of screening could be reduced. Investigators obtained 1-h and 2-h specimens in 347 of these women. A 34 percent reduction in the number of followup OGTT's required would have been achieved if a 2-h specimen had been used as the index instead of a 1-h specimen (P less than .05). As a result, the cost per patient identified with GDM would have declined 23.5

percent, from \$866 to \$662. Researchers cannot comment about the actual false-negative rate of either the 1-h or 2-h GCT because only select women underwent an OGTT. To assess validity of the 2-h threshold, researchers performed an OGTT in an additional 190 women if either the 1-h or 2-h screen was abnormal. The results were confirmatory: The 2-h screen would have reduced the cost per case identified by 32 percent in this small group. Screening on the basis of past medical history clearly lacked sensitivity and cost efficacy in comparison with the GCT. 6 tables, 9 references.

218

Screening for Syphilis in Pregnancy: An Assessment of the Costs and Benefits.

Form: Journal article.

Author: Williams, K.

Source: *Community Medical.*

7(1):37-42, February 1985.

Abstract: The substantial decline in the incidence of syphilis (especially among women) in Western countries since 1945 has led some to question the desirability of continuing routine antenatal serological screening for syphilis in pregnancy. No routine figures are available in England with regard to the incidence of maternal syphilis. A researcher estimated the incidence of syphilis in pregnancy for 1981 by sending out a postal questionnaire to all Special Clinics in England. He calculated the costs and benefits of the screening program by means of a computer-aided program that included a sensitivity analysis. The pathological analysis for syphilis as currently carried out by the West Midlands Regional Transfusion Service was computed at an average cost per test that included materials and labor, time required to take a sample, clerical time in completing request forms and producing reports, transport

and postage costs, and marginal costs. It was assumed that all women attending antenatal care by 26 weeks would be screened. Under various assumptions, the total cost savings from discontinuing screening ranged from 170,479 pounds to 325,493 pounds annually, with an average savings of 252,713 pounds annually. Benefits in terms of cost savings to the National Health Service resulting from the screening program ranged from 1,870,705 pounds to 6,975,587 pounds per year, with an average savings of 5,121,950. When other benefits to society were considered, estimated total benefits ranged from 3,243,845 pounds to 14,121,160 pounds per year, with an average savings of 8,322,610 annually. The benefit/cost ratio ranged from 9.20 to 1 to 82.83 to 1 with a best estimate of 32.93 to 1. Results suggest that, on economic grounds, there is a strong argument for continuing to screen routinely for syphilis in pregnancy. 1 table, 19 references.

Maternal Health

Alcohol, Tobacco, and Drug Use

219

Revised Conservative Estimate of the Incidence of FAS and Its Economic Impact.

Form: Journal article.

Author: Abel, E.L.; Sokol, R.J.

Source: *Alcoholism: Clinical and Experimental Research.* 15(3):514-524, May-June 1991.

Abstract: Researchers conducted a new analysis of the incidence of fetal alcohol syndrome (FAS) and its economic impact, basing evaluation on prospectively gathered data from consecutive pregnancies. This more conservative analysis reflects the researchers' concern over possible inclusion of false positives in their previous estimate (\$321 million) of total annual costs for FAS and now puts the overall rate in the western world at 0.33 cases per 1,000. The estimate among whites is 0.29 per 1,000 compared with 0.48 per 1,000 for African Americans; estimates for Native Americans are not included due to the absence of prospectively gathered data on FAS for this group. Retrospective studies suggest larger disparities. Both prospective and retrospective studies may be influenced by examiner bias, especially for minorities since they are often evaluated against standards derived for whites. Based on estimates and the number of African American and white children born annually, researchers estimate that 1,200 children are born with FAS each year in the United States. This is a probable lower limit based on considerations of ascertainment and absence of relevant information for other minorities such as Native Americans. In calculating economic costs, researchers adjusted estimates to consider costs that would be incurred whether cases were

FAS or not, and also include estimated costs for anomalies in FAS cases not considered in previous estimates. Based on these considerations, they estimate the incremented annual cost of treating this disorder at \$74.6 million. Approximately 75 percent of this economic cost is associated with care of FAS patients with mental retardation. 7 tables, 85 references.

220

Cost of Maternal Cocaine Abuse: I. Perinatal Cost.

Form: Journal article.

Author: Calhoun, B.C.; Watson, P.T.

Source: *Obstetrics and Gynecology.* 78(5, Part 1):731-734, November 1991.

Abstract: From September 1987 to October 1988, researchers compared the hospital charges of a cocaine-abusing population of pregnant women delivering at a Portland, Oregon, hospital with the charges of a matched control group delivering at the same hospital. The study compared 91 mother-infant pairs testing positive for cocaine at delivery with a screened drug-free control population matched for socioeconomic status, age, and parity. None of the subjects had medical insurance, adequate prenatal care, or a referring primary physician. Researchers reviewed patient charts and assessed clinical outcomes and hospital charges for labor, delivery, postpartum, and nursery care. Researchers assessed differences between the control and study groups with a paired, 2-tailed Student t-test, a noncorrected chi-square test, and a Mann-Whitney test for statistical significance. Data analysis indicated that maternal use of cocaine during pregnancy

contributed substantially to perinatal morbidity. The control group contained a significantly higher proportion of Southeast Asians, but was otherwise statistically similar to the study group in terms of background. Study group mothers were more likely to smoke and to have had fewer prenatal visits than control group mothers. Study group mothers were more likely to deliver prematurely and to have low birthweight or growth-retarded infants with (1) Apgar scores less than 7 at 5 minutes, (2) signs of cocaine exposure, (3) neonatal intensive care use, and (4) extensive hospitalization. There was a substantial cost difference between study group subjects and control group subjects. 2 tables, 21 references.

221

Drugs, Alcohol, Pregnancy, and the Neonate: Pay Now or Pay Later (Editorial).

Form: Journal article.

Author: Chasnoff, I.J.

Source: *Journal of the American Medical Association.* 266(11):1567-1568, September 18, 1991.

Abstract: A physician discusses the medical costs associated with infants born to drug- and alcohol-dependent women and asserts that the most cost effective way of handling the situation is to fund more prevention programs aimed at these women. Previous studies indicate that about 11 percent of infants born in the U.S. have been exposed to some illicit substance at some time during gestation and that 2.4 to 4.5 percent of pregnant women use cocaine during pregnancy. Estimated additional medical costs resulting from this situation range from \$385 million to \$3 billion. It has been shown that providing prenatal care and helping cocaine or alcohol addicted women to abstain during pregnancy significantly reduces the incidence of

prematurity, low birthweight, small head circumference, and other perinatal complications. The author advocates (1) a nationwide, comprehensive survey of this problem to improve assessment; and (2) the design of public education programs which can help prevent drug use during pregnancy. 21 references.

222

Hospital Costs for Cocaine-Exposed Infants.

Form: Journal article.

Author: Chiu, T.; Vaughn, A.J.; Carzoli, R.P.

Source: *Journal of the Florida Medical Association.* 77(10):897-900, October 1990.

Abstract: During November 1988-October 1989, researchers conducted a retrospective study at the University Medical Center at Jacksonville (Florida) to estimate the cost of treatment for 207 infants from cocaine-exposed pregnancies (151 African American and 56 white infants). Researchers reviewed the billing records for the patients. The sample was composed of infants either showing a positive urine test for cocaine or having a maternal history indicating cocaine abuse to the extent that the mother was referred to social services. Twenty-five infants (12 percent) were admitted into the neonatal intensive care unit (NICU) and 82 infants (88 percent) into the normal nursery. Average stay for a cocaine-exposed infant in NICU was 21.5 days (range 3-125 days). Average stay for a cocaine-exposed infant in the normal nursery was 6.7 days as compared with 2-3 days for normal infants, primarily because cocaine-exposed babies were detained in the normal nursery until discharge either to the parents or a foster home, depending on the outcome of Florida Department of Health and Rehabilitative Services (HRS) investigation of each baby's home situation. Approximately 45

percent of total days spent by babies in the normal nursery were due to social hold pending clearance for discharge by the HRS. Total charges for the 12-month period amounted to \$1,057,921, or \$5,110 per cocaine-exposed patient; for a control group matched by birthweight but with a maternal history that was negative for cocaine abuse, total charges were \$520,251 or \$2,513 per patient. Average costs per cocaine-exposed patient were \$36,481 for NICU (compared with \$17,721 for a control infant) and \$1,225 for normal nursery (compared with \$424 for a normal full-term infant). Laboratory fees accounted for the largest percentage (41.5 percent; \$15,147) of the total cost of hospitalization in the NICU (\$36,481), while rooming charges were the major factor in the excess normal nursery charges for cocaine-exposed infants (50.8 percent; \$401). 1 figure, 3 tables, 10 references.

223

Cost-benefit/Cost-effectiveness Analysis of Smoking Cessation for Pregnant Women.

Form: Journal article.

Author: Marks, J.S.; Koplan, J.P.; Hogue, C.; Dalmat, M.E.

Source: *American Journal of Preventive Medicine*. 6(5):282-289, September-October 1990.

Abstract: Researchers estimated the cost-effectiveness of a smoking cessation program for pregnant women to reduce low birthweight and perinatal mortality. They defined a cost-effective program as either improving health outcome and saving money or delivering a health benefit at an acceptable cost. Staff assessed the low birthweight and perinatal mortality attributable to maternal smoking during pregnancy, and then examined the costs of a smoking cessation program (e.g., booklets and additional personnel costs). The study

estimated costs (using the 1986 dollar as the base currency) and outcomes for the population of women in the United States who deliver babies each year. Assuming the program would cost \$30 per participant and that 15 percent of participants would quit smoking, researchers determined that a program offered to all pregnant smokers would shift 5,876 low birthweight infants into the normal birthweight range, and would cost about \$4,000 for each low birthweight infant prevented. Since infants born to smokers are at 20 percent greater risk for a perinatal death, a smoking cessation program could prevent 338 deaths at a cost of \$69,542 for each perinatal death averted. Compared with the costs of caring for these low birthweight infants in a neonatal intensive care unit, smoking cessation programs would save \$77,807,054 or \$3.31 per \$1 spent. Assuming a life expectancy of 75 years per additional survivor, discounted at 4 percent, the costs are \$2,934 per year of life gained. The cost per perinatal death averted ranges from \$36,210 to \$136,659 depending on the relative risk of LBW used in the calculation. The ratio of savings to costs increases to more than six to one when the equation includes reducing long-term care for infants with disabilities secondary to low birthweight in the benefits from smoking cessation programs. The authors conclude that physicians, third-party payers, managed-care organizations, and public health programs should offer this preventive service to all pregnant women who smoke. 1 table, 3 appendixes, 39 references.

224

Maternal Smoking During Pregnancy and Expenditures on Neonatal Health Care.

Form: Journal article.

Author: Oster, G.; Delea, T.E.; Colditz, G.A.

Source: *American Journal of Preventive Medicine.* 4(4):216-219, July-August 1988.

Abstract: Researchers estimated expenditures on neonatal care based on the relationship between maternal smoking during pregnancy and the increase of low birthweight (LBW). They combined estimates of the relative risk of LBW by maternal smoking status in each of three LBW groups with data on the prevalence of maternal smoking during pregnancy. The study examined the attributable risk of LBW in each group. Researchers multiplied estimates by the total number of United States live births in 1983 in each LBW group to yield estimates of the number of LBW's attributable to maternal smoking during pregnancy. Researchers used the probabilities of admission to a neonatal intensive care unit (NICU) for infants in each group to calculate the number of NICU admissions due to maternal smoking. They determined the marginal (or additional) cost per NICU admission, with all costs expressed in 1983 dollars. Researchers multiplied estimates of the additional cost per NICU admission by the number of NICU admissions due to maternal smoking to yield estimates of the additional cost of neonatal care attributable to maternal smoking in each LBW group. Summation of the costs across LBW groups yielded the additional costs of neonatal care attributable to maternal smoking during pregnancy. Researchers multiplied the number of live births in each LBW group by the probability of NICU admission for infants in that group to determine the total number of NICU admissions. The total cost of NICU care in 1983 came from multiplying that estimate by the mean charge per NICU

admission. Results indicated maternal smoking during pregnancy was responsible for 14.5 percent of all low weight births in 1983. The study found that 6.6 percent of all admissions to NICU's resulted from maternal smoking, representing 8.5 percent of total national expenditures on NICU services. The average cost of neonatal care was \$288 higher for infants born to smokers than those born to nonsmokers. 1 table, 31 references.

225

Neonatal Costs of Maternal Cocaine Use.

Form: Journal article.

Author: Phibbs, C.S.; Bateman, D.A.; Schwartz, R.M.

Source: *Journal of the American Medical Association.* 266(11):1521-1526, September 18, 1991.

Abstract: Researchers examined the added neonatal cost and length of hospital stay associated with fetal cocaine exposure in a large, public, inner-city hospital from 1985 to 1986. Three hundred fifty-five cocaine-exposed infants were compared with a random sample of 199 unexposed infants. Regression analysis was used to control for the independent effects of maternal age, smoking, alcohol consumption, prenatal care, race, gravidity, and sex of the infant. All infants were routinely tested for illicit substances, records were reviewed for maternal histories of substance abuse, and all known cocaine-exposed singleton infants were included. The main outcome measures included (1) cost and length of stay until each infant was medically cleared for hospital discharge, and (2) cost and length of stay until each infant was actually discharged from the hospital. Results indicate that neonatal hospital costs until medically cleared for discharge were \$5,200 more for cocaine-exposed infants than for unexposed infants (a difference of \$7,957 versus \$2,757).

The costs of infants remaining in the nursery while awaiting home and social evaluation or foster care placement increased this difference by more than \$3,500. Compared with other forms of cocaine, fetal exposure to crack was associated with much larger cost increases (\$6,735 versus \$1,226). Exposure to other illicit substances in addition to cocaine was also associated with much larger cost increases (\$8,450 versus \$1,283). At the national level, these individual medical cost estimates add up to about \$500 million. The magnitude of these costs indicates that effective treatment programs for maternal cocaine abusers could yield savings within their first year of operation. 4 tables, 32 references.

Maternal Health

Adolescent Pregnancy

226

Estimating the Public Costs of Teenage Childbearing.

Form: Journal article.

Author: Burt, M.R.

Source: *Family Planning Perspectives*.

18(5):221-226, September-October 1986.

Abstract: A researcher (1) reviewed 12 studies that estimated public costs attributable to teenage childbearing; (2) derived a formula for making national, state, and local estimates of the cost to the public of teenage childbearing from this review; and (3) applied the formula to United States data.

Calculations yielded a single-year cost for 1985 of \$16.65 billion paid through three programs (Aid to Families with Dependent Children, \$8.32 billion; food stamps, \$3.42 billion; and Medicaid, \$4.91 billion) for women who first gave birth as teenagers. Calculations also showed that the public will pay an average of \$13,902 over the next 20 years for the family begun by each first birth to a teenager in 1985 and \$5.16 billion over the same period for the families of all teenagers experiencing a first birth in 1985. If all teenage births were delayed until the mother was age 20 or older, potential savings to the public would be \$5,560 for each birth delayed and \$2.06 billion for the entire cohort of teenagers who would otherwise have had a first birth in 1985. Estimates of public outlays for teenage childbearing are time-consuming but not difficult, and should be readily available to policy makers and program planners throughout the United States. 1 figure, 2 tables, 38 references.

227

Planning Programs for Pregnant Teenagers: First You Define the Problem.

Form: Journal article.

Author: Burt, M.R.; Sonenstein, F.L.

Source: *Public Welfare*. 43(2):28-36,

Spring 1985.

Abstract: Researchers explored critical issues affecting teenage pregnancy and parenting by collecting data from 21 federally funded care programs established in 1982 for pregnant and parenting teens by the Office of Adolescent Pregnancy Programs, Department of Health and Human Services. Analyses are based on 1,054 clients entering a project either pregnant or with a baby and having at least one followup after the baby's birth. From client records, researchers noted the teens' entry characteristics, data on service delivery, information on pregnancy outcome and educational and vocational achievement, employment and welfare status, and followup data on repeat pregnancies. Findings showed that (1) those who fund programs would be better advised to support nonhospital programs that have good interagency links to local hospitals, since any one program structure can work as well as another; (2) girls who were pregnant when they entered a program received more services than those who already had one or more children; and (3) girls on welfare received more services than those who were not. The shorter the length of followup, the more services the client received. Service costs for 12 months' support to a pregnant or parenting teen varied widely depending on client type, from \$5,283 for a teen who was not receiving support from Aid to Families with Dependent Children (AFDC) and who

entered the program pregnant and delivered in the program, to \$9,592 for an entry mother on AFDC. Public agencies planning similar programs must (1) develop interagency coordination with great care, allowing adequate time; and (2) establish clear guidelines for case management, for tracking clients, and for keeping adequate client records. Programs must address the needs of the teenage parent as well as the pregnant teen. School dropouts are an underserved group; they would benefit from special efforts at the state or local level. 3 tables.

228

Teenage Welfare Receipt and Subsequent Dependence Among Black Adolescent Mothers.

Form: Journal article.

Author: Duncan, G.J.; Hoffman, S.D.

Source: *Family Planning Perspectives*.
22(1):16-20, 35, January-February 1990.

Abstract: Researchers examined teenage welfare receipt and subsequent dependence among black adolescent mothers. Rather than using a statistical model to distinguish state of dependence from heterogeneity, researchers used a set of parental and sibling measures to adjust directly for family and neighborhood-based heterogeneity. Data used were from the 1985 cross-year file Panel Study of Income Dynamics (PSID) on women who were observed both throughout their teenage years and in their twenties to investigate the extent to which welfare receipt affects their future economic independence. Subjects include 316 black women between 14 and 26 who were both members of PSID households and members of households where 1985 interviews were conducted. Researchers first observed the subjects between the ages of 14 and 19 so births could be compared with data on possible receipt of Aid to Families with Dependent

Children (AFDC) and so their family conditions could be measured as of age 14. Births were considered to be out-of-wedlock if they occurred prior to the mother's twentieth birthday and the mother's first marriage. A birth was considered to accompany AFDC if AFDC income was reported in either of the first two years following the child's birth. Of the 316 young black women, 131 had at least one out-of-wedlock birth before age 20, and 82 had at least one out-of-wedlock teenage birth accompanied by receipt of AFDC. The sample of black teenagers was divided into four categories for analysis: (1) Those who had at least one teenage out-of-wedlock birth that was accompanied by AFDC receipt, (2) those who had at least one teenage out-of-wedlock birth that was not linked to AFDC receipt, (3) those who had no out-of-wedlock births but at least one marital birth during their teenage years, and (4) those who had no teenage births. The first category was divided into (1) AFDC benefit levels in the state of residence, (2) age of the mother at the time of her first birth, and (3) whether the teenage mother lived with a parent or independently in the year following the birth. Regression analyses determined that black teenage mothers who receive benefits through AFDC around the time they give birth are more likely to be receiving AFDC at age 26 than are other black teenage mothers or women who do not have a teenage birth, even after adjustments are made for differences in parental background and the economic accomplishments of siblings. The average earned family income at age 26 among the mothers who had received AFDC as teenagers was \$8,600, half that of the other groups (between \$15,900 and \$17,700) even when transfer income is included. Black teenage mothers who receive benefits through AFDC around the time they give birth are also more likely to have a lower earned family income and a lower total family income. Findings suggest that AFDC receipt around the time of nonmarital teenage birth may be an

independent cause of future economic problems. 2 tables, 5 references.

229

Socioeconomic Consequences of Teen Childbearing Reconsidered.

Form: Journal article.

Author: Geronimus, A.T.; Korenman, S.

Source: *Quarterly Journal of Economics.* 107(4):1187-1214, November 1992.

Abstract: Researchers present new estimates of long-term socioeconomic disadvantages for mothers and children of teenage childbearing. The new estimates take into account unmeasured family background heterogeneity by comparing sisters who timed their first births at different ages and by using a within-family estimation to control family background heterogeneity. The researchers present conventional cross-sectional estimates using the same data and compare the two types of estimates to gauge the degree to which differences in family background of mothers contribute to the large cross-sectional associations between teenage childbearing and socioeconomic status of mothers later in life. Researchers analyzed samples of sisters from three data sets: (1) The National Longitudinal Survey Young Women's Sample (NLSYW), (2) the Panel Study of Income Dynamics (PSID), and (3) the National Longitudinal Survey Youth Sample (NLSY). Researchers grouped socioeconomic indicators into primary outcomes and secondary outcomes. The primary outcomes were total family income, income-to-needs-ratio (1981 U.S. poverty threshold), poverty status, and welfare status. The secondary outcomes were whether or not a woman completed high school, whether she completed at least one year of postsecondary schooling, her current employment status, and her marital status. Results indicate large differences in indicators of socioeconomic

status according to the age at which a woman times her first birth. For most direct measures of long-term economic well-being, results from the NLSYW and the NLSY samples suggest that unmeasured family background heterogeneity biases traditional cross-sectional estimates. In the NLSYW sample in 1982, among women aged 28 to 38, those who had first births after age 19 lived in families with over 40 percent higher income. Total family income in 1981 dollars was \$18,045 for teens and \$25,258 for non-teens in the cross-sectional data and \$19,339 for teens and \$21,870 for non-teens in within-family data in the NLSYW sample; \$15,684 for teens and \$24,873 for non-teens in the cross-sectional data and \$16,876 for teens and \$23,090 for non-teens in within-family data in the PSID sample; and \$11,864 for teens and \$21,670 for non-teens in the cross-sectional data and \$12,649 for teens and \$17,101 for non-teens in within-family data in the NLSY sample. Approximately 20 percent of the women who became teenage mothers were on welfare in 1982 compared with approximately 5 percent of women who had first births at older ages. Nearly 90 percent of older mothers had graduated from high school in 1982, versus 66 percent of women who were teenage mothers. Women who had births after age 19 were more than twice as likely as teen mothers to have completed at least one year of postsecondary schooling. Women who were teenage mothers were also less likely to be married as of their 1982 interviews. The differences in primary socioeconomic outcomes as a result of teenage birth remained substantial when differences in measured individual attributes and family background were examined. The differences in secondary socioeconomic outcomes were not as dramatic as outcomes for more direct measures of economic well-being. The mechanisms whereby teen childbearing is associated with lower family income are sister differences in fertility timing, age, urban residence, education, and current marital

status. In two of the three data sets examined, sister comparisons suggest that biases from family background heterogeneity were important, and therefore that earlier studies may have overstated the consequences of teen childbearing. Previous estimates of the effects of teen childbearing have failed to adequately control for family background differences among women who have births at different ages.

230

Socioeconomic Costs of Teenage Childbearing: Evidence and Interpretation.

Form: Journal article.

Author: Geronimus, A.T.; Korenman, S.

Source: *Demography*. 30(2):281-290, May 1993.

Abstract: Researchers discuss their 1992 study on the socioeconomic costs of adolescent childbearing through a sibling approach as a matched comparison study group, which the authors feel provides a more complete set of match characteristics than matching measured or observable family background characteristics. The authors assert that a recent replication of this 1992 study by Hoffman et al. in 1993 supports their principal conclusions that (1) standard cross-sectional estimates of the consequences of adolescent childbearing are biased by failure to control adequately for family background differences between women who have first births as teenagers and those who have first births at later ages, and (2) previous estimates are likely to have exaggerated the costs of adolescent childbearing. The authors are concerned that Hoffman et al. gives the impression that within-family estimates (i.e., sister differences) derived from the Panel Study of Income Dynamics (PSID) or the National Longitudinal Study of Youth (NLSY) are preferable to those based on the National Longitudinal Survey of

Young Women (NLSYW). Hoffman et al. states that because the PSID and NLSY within-family estimates are larger than the NLSYW estimates, the weight of the evidence suggests that the effects of adolescent parenthood on subsequent socioeconomic status are likely to be sizable, although smaller than has often been assumed. The authors take exception with 1993 Hoffman et al.'s suggestion that PSID estimates are preferable and that the NLSYW estimates are outliers since (1) the precision of the within-family estimates is not high in any of the samples; and (2) the greater number of sibling pairs is obtained at the cost of including some very young women (between 21 and 25 years of age), which impacts the study purpose of long-term followup and outcome measures and produces overessimistic assessments of socioeconomic status. When testing the NLSYW sampling restriction in PSID data, the authors feel that Hoffman et al.'s standard error is large; the PSID within-family point estimates remained much larger than the corresponding estimates from the NLSYW. The authors assert that Hoffman et al.'s hypothesis that genuine cohort differences may exist between the NLSYW sample and the PSID sample (since more adolescent births are currently more likely out-of-wedlock births, the cohort may suffer larger costs) is speculation without any empirical test. The within-family effect of an adolescent birth on the probability of being married at followup appears smaller in the PSID and NLSY than in the NLSYW sample. The authors also state that the sibling sample from the PSID and NLSY data sets are unrepresentative because (1) they overrepresent the unmarried, (2) sister samples overrepresent large families, and (3) sibling samples exaggerate any problems associated with attrition. A comparison of the cross-sectional estimates for the NLSYW, PSID, and NLSY on the effect of an adolescent birth on income/needs found that the NLSYW sisters subsample appears to yield more representative

coefficient estimates than the PSID and the NLSY. Given the difficulty of accounting for selection into adolescent childbearing across and within populations, and within families, the authors believe that the size of any true effects of adolescent births on socioeconomic status must be considered an open question. 1 table, 8 notes, 40 references.

231

Reevaluating the Costs of Teenage Childbearing.

Form: Journal article.

Author: Hoffman, S.D.; Foster, E.M.; Furstenberg, F.F.

Source: *Demography*. 30(1):1-13, February 1993.

Abstract: To distinguish the effect of teen childbearing from that of family background, researchers used data from the Panel Study of Income Dynamics (PSID) and compared teenage mothers with their sisters. The PSID is a national survey of American families conducted since 1968 by the Institute for Social Research. The sample includes 856 sisters (428 sister pairs) between ages 21-33 in 1987; for each pair, one sister had a teenage birth and the other did not. For each woman, researchers gathered information on (1) age at first birth, (2) educational attainment, (3) marital and fertility history, (4) family income, and (5) receipt of Aid to Families With Dependent Children (AFDC). The sample appears to be nationally representative; the age, race, marital status, education, and fertility distributions of the sisters correspond closely to Census Bureau estimates. The statistical technique used was a fixed-effects model. Analysis showed that accounting for unobserved family background reduces, but does not eliminate, the estimated consequences of early childbearing; statistically significant and quantitatively important effects of teenage

parenthood remain for high school graduation, family size, and economic well-being. Results showed that postponement of first birth until at least age 20 would result in (1) a high school graduation level of 71.6 percent (vice 54 percent for teen mothers), (2) a college graduation level of 25.9 percent (vice 13.6 percent for teen mothers), (3) a poverty level of 15.6 percent (vice 28.4 percent for teen mothers), (4) 57.9 percent in the middle class (vice 22.1 percent for teen mothers), (5) 16.6 percent receiving AFDC (vice 27.9 percent for teen mothers), (6) 61.9 percent married at first birth (vice 50.6 percent for teen mothers), (7) 81 percent ever married (vice 74.6 percent for teen mothers), and (8) family size of 1.61 children (vice 2.05 for teen mothers).

Postponing childbirth from age 18 to age 22 results in a 25 percent increase in the income-needs ratio. The weight of the empirical evidence suggests that the effects of teen parenthood are smaller than has often been assumed but may still be sizable. 4 tables, 19 references.

232

Reevaluating the Costs of Teenage Childbearing: Response to Geronimus and Korenman.

Form: Journal article.

Author: Hoffman, S.D.; Foster, E.M.; Furstenberg, F.F.

Source: *Demography*. 30(2):291-296, May 1993.

Abstract: In response to a commentary, researchers assert that early childbearing is harmful to already disadvantaged women and that educational attainment and economic well-being are reduced by an adolescent birth, even after controlling for effects of family background. In research on adolescent childbearing and its effects on socioeconomic status, Geronimus and Korenman estimated

fixed-effect models in which they compared socioeconomic outcomes for sisters who had first births at different ages. Using data from the National Longitudinal Survey of Young Women (NLSYW), Geronimus and Korenman reported that the effects of early childbearing were smaller than previous estimates and statistically insignificant for a range of outcomes, including economic status and probability of high school graduation.

Hoffman, et al. replicated Geronimus and Korenman's NLSYW analyses using a similar methodology applied to three major data sets and four samples, including a nationally represented sample of young women from the Panel Study of Income Dynamics (PSID) and from the National Longitudinal Study of Youth (NLSY). All replications show statistically significant and negative effects of adolescent childbearing on economic status and on the probabilities of being officially poor and of not graduating from high school. The effect on the probability of acquiring some postsecondary education is consistently negative, but not always statistically significant. Hoffman, et al. identified several reasons why the NLSYW results might differ from the others: (1) The NLSYW sisters sample might be unrepresentative because of selective inclusion of older women; (2) a smaller sample of sisters was obtained in the NLSYW than the PSID, 456 versus 210; and (3) women between 20 and 24 years of age at the baseline were underrepresented in the NLSYW sisters sample, relative to the full NLSYW sample and the Census data. Geronimus and Korenman argue that the effects of adolescent childbearing diminish over time and as the adolescent mothers move from early to later adulthood, they may catch up with the later childbearers. Hoffman, et al. assert that (1) the smaller estimated effect of an adolescent birth on economic status in the NLSYW could be evidence of a life-cycle effect; and (2) the estimated effects of adolescent birth increase with the inclusion of

additional years of data as indicated in 56 sister pairs, one who had an adolescent birth and one who had not. Out of the 56 childless sisters, 85 percent had graduated from high school and 32 percent had postsecondary schooling as compared to 64 percent and 23 percent, respectively for the adolescent birth sister. Geronimus and Korenman argue that NLSYW is the preferred sample because it is the only sample in which the cross-sectional estimate of the effect of an adolescent birth on economic status is the same for the subsample of women with sisters and for the full sample of all women. Hoffman, et al. suggest further study on whether the effects of adolescent birth differ for women with or without sisters. Hoffman, et al. also assert that since Geronimus and Korenman offer no explanation for their sample and why it appears only in the NLSYW, the sample is simply used as a convenient, albeit unorthodox, way to support their findings. Hoffman, et al. suggest that it is premature to conclude that the effects of adolescent childbearing on creation and perpetuation of social disadvantage are small. 1 table, 9 notes, 11 references.

233

Process, Costs, and Outcomes of Community-Based Prenatal Care for Adolescents.

Form: Journal article.

Author: Kay, B.J.; Share, D.A.; Jones, K.; Smith, M.; Garcia, D.; Yeo, S.A.

Source: *Medical Care.* 29(6):531-542, June 1991.

Abstract: From January 1981 through June 1988, researchers compared differences in care provided by a community-based prenatal care program designed specifically for adolescents relative to traditional prenatal care (not adolescent-focused) delivered at a university medical center. Researchers evaluated the

resulting costs and pregnancy outcomes of the two programs in terms of (1) average number of prenatal visits per client, (2) percentage of clients beginning prenatal care during the first trimester of pregnancy, (3) percentage of clients with full-term births, (4) percentage of clients with low-birthweight births, (5) percentage of clients with maternal complications, (6) percentage of clients' infants needing neonatal intensive care, (7) value of resources consumed in delivering prenatal care, and (8) differences in postpartum pregnancy rates and use of contraceptives. Researchers compared 180 adolescent clients of The Young Adults' Health Center in Ypsilanti, Michigan, (study group) with a sample of adolescent clients of the University of Michigan Women's Hospital (control group). The samples were matched for age and year of delivery. There were no significant medical or socioeconomic differences between the two samples, except that study group clients were significantly more likely to be without insurance coverage. The teen-focused program provided health services and peer education stressing pregnancy prevention and comprehensive primary health care. Four indexes described (1) the clients' medical history, (2) medical factors that put them at risk during the pregnancy, (3) pregnancy outcome complications, and (4) complications to the newborn. The programs were significantly different as measured by the mean number of (1) prenatal visits, (2) nonscheduled outpatient visits, (3) nonstress tests, (4) ultrasounds, and (5) inpatient days during pregnancy. There were no statistically significant differences in (1) gestational age, (2) birthweight, (3) percentage of infants needing neonatal intensive care, and (4) percentage of clients with maternal complications. The average cost of resources consumed during prenatal care for the study group was 41 percent that of the control group. Compared with the control sample, study group clients were significantly

more likely to have ceased smoking during pregnancy and to use contraceptives and significantly less likely to become pregnant again after delivery. 5 tables, 14 references.

234

Teenage Pregnancy and Parenthood in Illinois: Estimated 1979-1983 Costs.

Form: Journal article.

Author: Reis, J.

Source: *Journal of Adolescent Health Care*. 8(2):177-187, March 1987.

Abstract: A researcher estimates the 1979-1983 public and private costs of teenage pregnancy and teenage parenthood in Illinois. The analyses include estimates of (1) the cost associated with the care of the 1983 cohort of 44,000 pregnant Illinois adolescents; (2) the costs of care for approximately 100,000 adolescents giving birth between 1979 and 1983; (3) the costs of resources consumed by these mothers and their children for the first 5 years of the child's life; (4) the financial contribution of individuals and business; and (5) federal, state, county, and municipal taxes for the care rendered. Data came from public records, national and local surveys, and knowledgeable professionals. The unit costs per person for 32 categories of service were adjusted according to whether the service was 1 time (e.g., birth) or ongoing (e.g., nursing home care). The unit costs were weighted according to the number of individuals involved and the duration of services provided. The total base costs (\$784 million), a 21 percent federal income tax penalty which is applied to those services receiving full or partial federal government support based on the sources of revenue (\$39 million), and medical costs shifting to business (\$29 million) were calculated. Estimates of the total cost of services consumed were apportioned according to corporate, state, federal, municipal, and

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private individuals as sources of revenue. An additional amount was added to the estimated costs through an 18 percent cost-shifting penalty and was applied to the proportion of services paid for by corporations. As of 1983, Illinois businesses and citizens paid \$848 million for services rendered to the 5-year cohort of 94,000 teenage mothers and their 137,483 children. This sum includes \$152 million annually for business and \$696 annually for individuals. Each Illinois household paid an average of \$84 out of pocket, \$81 dollars in higher state and federal taxes, and \$37 in higher prices due to business pass-through, for a total of \$202 per year per household. The \$152 million paid by business subdivided into annual fees of \$42 million for employee medical costs related to teenage pregnancy, \$28 million in medical cost shifting, and \$82 million in higher state and federal taxes. The ratio of the costs of curative and support services for pregnant and parenting teens relative to services to prevent pregnancy in sexually active teenagers is \$808,304 million for curative/support services to \$39,600 million for prevention. Three appendixes list data sources. 6 figures, 1 table, 39 references.

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Cesarean Section

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Births by Cesarean: Cost Changes, 1982-83 to 1986.

Form: Journal article.

Author: Anon.

Source: *Statistical Bulletin Metropolitan Insurance Company.* 69(3):18-25, July-September 1988.

Abstract: Cesarean birth rates climbed to an all-time high in the United States in 1986 at 24.1 per 100 deliveries. Metropolitan Life Insurance Company statisticians studied the costs associated with a Cesarean childbirth in 1986 and compared them to charges for a 1.5 year period (1982-1983). For both Metropolitan Life and other insurance carriers, Cesarean rates were highest in the South and lowest in the Midwest. Average charges for a C-section in 1986 totaled \$5,270, with the Pacific region having the highest costs (\$6,600). The Middle and South Atlantic regions were the only other areas to exceed the national average; the lowest was in the East South Central region of the United States (less than \$5,000). The Pacific and Middle Atlantic areas had the highest average charges in both study periods. In the East North Central region, the average charge changed from 7 percent above the national average to 3 percent below it. The District of Columbia and Nevada led in total costs, with C-section charges at 33 percent above the national total. The lowest average C-section charge was \$3,680 in Montana for 13 cases (30 percent below the national average). Other states with lower charges included North Carolina, South Dakota, Virginia, Minnesota, Maine, Wyoming, Iowa, and South Carolina. Hospital costs for room, board, and ancillary

fees averaged \$3,240 in 1986. Physician fees averaged \$2,030 and varied extensively between regions and states. Total charges for a C-section in 1986 were 28 percent higher than those in 1982-1983 (\$5,270 versus \$4,130). Physician charges increased the most (by 59.8 percent), rising from \$1,270 to \$2,030. Room and board charges decreased by 4.3 percent across the country but with large fluctuations among different states. More public health education is needed to reduce the rate of cost increase for C-sections. 2 figures, 3 tables, 15 references.

236

Costs for Cesarean Section: Regional Variations.

Form: Journal article.

Author: Anon.

Source: *Statistical Bulletin Metropolitan Insurance Company.* 67(3):2-10, July-September 1986.

Abstract: The highest proportions of Cesarean (C) section deliveries are reported in the Northeastern and Southern regions of the United States, according to a study by the Metropolitan Life Insurance Company. The lowest were in the West and Midwest. Many researchers believe that the differences are not due to geographic differences in the distribution of high-risk populations. The study was based on 8,636 C-sections paid for by the insurance company in a 1.5-year period in 1982-1983. The lowest total charge occurred in the South (\$3,780), the area that contributed the largest proportion of cases and reported the second shortest length of hospital stay. The highest was in the West (\$4,550).

The average total charge in 1982-1983 for a Cesarean birth was \$4,130. The highest average charge for C-section delivery was in the company's Pacific division, at close to \$5,000. The Middle Atlantic division had the second highest charges, at close to \$4,960. The East North Central division average was 7 percent above the national average. Total charges for a Cesarean birth differed by as much as 182 percent among states. The District of Columbia led in charges, 30 percent above the national average, followed by California, Illinois, and New York (\$5,300, \$5,300, and \$5,290, respectively). The lowest total charge was in Utah (\$2,940, or 29 percent below the national average). Other states with low charges included Kentucky, Mississippi, and Iowa. Ancillary charges averaged three-fifths of the total hospital bill. Physician charges varied extensively, both among geographic areas and individual states, with the average physician charge for a C-section of \$1,270. California and New York had the highest physician charges (\$1,890 and \$1,780). 2 figures, 1 table, 9 references.

237

Hospital Utilization and Mortality Levels for Patients in the Arizona Health Care Cost Containment System.

Form: Journal article.

Author: Burns, L.R.; Wholey, D.R.; Abeln, M.O.

Source: *Inquiry*. 30(2):142-156, Summer 1993.

Abstract: Researchers examine the experience of Arizona's experimental Medicaid program, the Arizona Health Care Cost Containment System (AHCCCS), in achieving hospital utilization levels and morbidity outcomes comparable to those patients with private insurance. They evaluated severity-of-illness at hospitalization, hospital utilization (total

charges, length of stay, charges per day), and inpatient mortality for AHCCCS beneficiaries compared to privately insured patients. The subjects included 121,874 discharges of patients with 11 different conditions from nonfederal general hospitals in Arizona during 1989 and 1990. The conditions were six medical/surgical diagnoses (pneumonia, myocardial infarction, gastrointestinal bleeding, dehydration, aorta repair/replacement, and large bowel resection), three pediatric diagnoses (pediatric pneumonia, bronchitis/asthma, and esophagitis/digestive disorders), and two maternity diagnoses (cesarean section and vaginal delivery). Patient characteristics and outcomes for 11 selected conditions, which included number of discharges, number of mortalities, mortality rate, length of stay (mean and standard deviation), and hospital charges (mean and standard deviation), respectively were (1) 3,915, 99, 0.025, 5.40 (3.5) days, \$6,192 and \$4,970 for pneumonia; (2) 979, 39, 0.040, 8.64 (8.09) days, \$21,629 and 23,016 for aorta repair/replacement; (3) 3,415, 135, 0.039, 6.08 (3.65) days, \$10,792 and \$7,345 for myocardial infarction; (4) 2,847, 64, 0.022, 11.04 (10.29) days, \$18,893 and \$27,039 for large bowel resection; (5) 2,319, 45, 0.019, 4.15 (7.70) days, \$5,163 and \$5,581 for gastrointestinal bleeding; (6) 1,960, 69, 0.035, 4.79 (5.15) days, \$5,391 and \$6,901 for dehydration; (7) 3,389, mortality not available, 3.79 (2.76) days, \$3,930 and \$4,040 for pediatric pneumonia; (8) 6,749, mortality not available, 2.94 (4.24) days, \$3,283 and \$3,122 for bronchitis/asthma; (9) 3,485, mortality not available, 2.62 (2.79) days, \$2,169 and \$2,883 for esophagitis/digestive disorders; (10) 20,456, mortality not available, 4.11 (3.92) days, \$5,140 and \$3,338 for cesarean section; and (11) 72,360, mortality not available, 1.64 (1.65) days, \$2,027 and \$1,490 for vaginal delivery. After controlling for severity of illness and the specific hospital used, as well as several

patient, hospital, and physician factors, regression analysis and the Acuity Index Method (AIM) suggested that the AHCCCS program achieved comparability with private health insurance in hospital charges, length of stay, charges per day, mortality, and inpatient care. There was less comparability between AHCCCS and private insurance for patients with maternity diagnoses. AHCCCS women undergoing vaginal delivery experience significantly lower hospital charges and shorter hospital stay. AHCCCS patients undergoing cesarean section experienced significantly higher charges and longer stays.

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Cost of Antibiotic Prophylaxis in Cesarean Section.

Form: Journal article.

Author: Ford, L.C.

Source: *Drug Intelligence and Clinical Pharmacy*. 20(7-8):592-593, July-August 1986.

Abstract: To compare the respective efficacies of piperacillin and cefoxitin in preventing postoperative infection associated with cesarean section and the cost of failure associated with each regimen, researchers randomly assigned 263 patients at the University of California Los Angeles (UCLA) Medical Center to receive either piperacillin or cefoxitin for prophylaxis in cesarean section. Piperacillin is an extended-spectrum penicillin and cefoxitin is a second-generation cephalosporin; both were selected because of their known in vitro and in vivo activities against common obstetric pathogens. The two study groups did not differ significantly for number of patients, mean age, mean weight, duration of surgery, or duration of postoperative hospitalization. Criteria used to evaluate the efficacy of the regimens included (1) febrile morbidity, (2) duration of

hospitalization, (3) administration of systemic antibiotics postoperatively, and (4) wound healing and evidence of infection at the operative site. A satisfactory prophylactic response was defined as no bacterial or clinical infection at the operative site for 4-6 weeks postoperatively. Although both drugs were considered effective, piperacillin achieved a level of 98 percent satisfactory prophylaxis compared with only 91 percent for cefoxitin. To determine whether piperacillin's clinical excellence is associated with cost savings, researchers calculated the total costs of prophylactic failure in cesarean section; compared the average failure rates associated with ampicillin (23 percent), cephalothin (18 percent), cefoxitin (9 percent), and piperacillin (2-3 percent) based on 100 patients. Total costs of prophylactic failure were calculated based on 100 patients: Ampicillin, \$140,833; cephalothin, \$91,848; cefoxitin, \$79,074; and piperacillin, \$26,358. Because of its high failure rate, ampicillin was the most expensive antibiotic and piperacillin was the least expensive. 14 references.

239

Effect of Health Coverage for Uninsured Pregnant Women on Maternal Health and the Use of Cesarean Section.

Form: Journal article.

Author: Haas, J.S.; Udvarhelyi, S.; Epstein, A.M.

Source: *Journal of the American Medical Association*. 270(1):61-64, July 7, 1993.

Abstract: Researchers examine the effect of health coverage for uninsured, low-income pregnant women on maternal health and the use of cesarean section. Researchers hypothesized that the Healthy Start program would be associated with an increase in the use of cesarean section for uninsured women relative to women with insurance. The

Healthy Start program was funded by the state of Massachusetts to provide health insurance to uninsured low-income women (including women with incomes below 185 percent of the federal poverty level) who are not eligible for Medicaid. The program covered prenatal visits, in-hospital care, laboratory, and pharmacy services. To avoid selection bias, researchers assessed the change in maternal outcomes and rates of cesarean section for all uninsured women in 1984, and for all women who were uninsured or covered by Healthy Start in 1987. The uninsured mothers were compared to two concurrent control groups, those with private insurance and Medicaid beneficiaries. Researchers focused on adverse maternal conditions that fit three criteria: (1) Clinical face validity, (2) data sensitivity (diagnoses that would be noted at the time of delivery in a discharge abstract), and (3) importance (cause of morbidity). Subjects were all in-hospital, single-gestation births: 57,257 in 1984, and 64,346 in 1987. Researchers used a logistic regression to compare rates of adverse maternal outcome and cesarean section, to calculate the difference in rates between the uninsured and each concurrent control, to examine the interpayer differences in rates between 1984 and 1987, and to measure the effects of Healthy Start. Compared with women who received inadequate prenatal care, women who received satisfactory prenatal care were less likely to have severe pregnancy-induced hypertension, placental abruption, and a hospital stay greater than their infants. In 1984, uninsured women had higher rates of adverse maternal outcome than privately insured women (5.5 percent and 5.1 percent, respectively; interpayer difference 0.4 percent) and received fewer cesarean sections (17.2 percent and 23.0 percent; interpayer difference 5.8 percent). Between 1984 and 1987, there was no statistically significant change in the interpayer difference in adverse outcome relative to women with private insurance.

However, the interpayer difference in cesarean sections between the uninsured and the privately insured was reduced by 2.3 percent, although the uninsured continued to undergo fewer cesarean sections (22.4 percent and 25.9 percent). Similar results were observed when the uninsured women were compared with women with Medicaid. Findings suggest that the provision of health insurance alone to low-income pregnant women may not be associated with an improvement in maternal health. Expanded coverage was associated, however, with an increase in the rate of cesarean section. 2 tables, 24 references.

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Acute Childbirth Morbidity: Its Measurement Using Hospital Charges.

Form: Journal article.

Author: Hage, M.L.; Helms, M.J.; Dudley, A.; Stead, W.W.; Hammond, W.E.; Neyland, C.; Hammond, C.B.

Source: *American Journal of Obstetrics and Gynecology*. 166(6, Part 1):1853-1862, June 1992.

Abstract: Researchers at Duke University Medical Center in North Carolina performed an analytic descriptive analysis of acute childbirth morbidity, comparing patients delivered by primary cesarean section with those delivered vaginally. Investigators combined all primary cesarean deliveries and vaginal deliveries from July 1, 1981-June 30, 1986 with maternal and infant charge data, analyzing 7,256 patients. Investigators performed a description of the charges for the associated diagnoses and used a morbidity index to identify differences in predicted median hospital charges with 95 percent confidence intervals. Results showed that the ratio of mean primary cesarean delivery to mean vaginal delivery total charges was 2.5:1. The magnitude of the mean hospital charges

was inversely related to the frequency of the indication, with the lowest charges associated with dystocia and the highest with multiple pregnancy. Antepartum risk factors (increased maternal age, patient referral) were associated with increases in maternal and infant morbidity as measured by the morbidity index. Chronic maternal hypertension resulted in decreased maternal morbidity but increased infant morbidity when primary cesarean delivery was used. Although preterm delivery was associated with large increases in charges, it was not significantly altered by using primary cesarean delivery. Risk factors associated with management of abnormalities of labor were associated with decreases in maternal and infant morbidity when primary cesarean delivery was used. Analysis of acute childbirth morbidity, as measured by hospital charges, showed marked variation of diagnosis and risk-specific charges for patients delivered by primary cesarean section. Specific dollar figures were not stated for hospital charges. 5 figures, 2 tables, 19 references.

241

Patient Costs in the Prevention and Treatment of Post-cesarean Section Infection.

Form: Journal article.

Author: Iams, J.D.; Chawla, A.

Source: *American Journal of Obstetrics and Gynecology*. 149(4):363-366, June 15, 1984.

Abstract: Researchers compared the cost to the patient of commonly used therapeutic and prophylactic agents in a theoretical model population of 450 women who were delivered by cesarean section. Assumptions included a 35 percent incidence of postcesarean febrile morbidity, with a reduction to 20 percent if all women who underwent cesarean section delivery received antimicrobial prophylaxis, and hospitalization of 6 days postpartum in the

absence of febrile morbidity. One prophylactic and four therapeutic regimens were compared: (1) Cefazolin intravenous prophylaxis, (2) ampicillin and gentamicin, (3) clindamycin and gentamicin, (4) cefoxitin, and (5) moxalactan. Daily bed charges were \$155; the minimum additional cost to the patient for use of gentamicin was \$132.90. Treatment assumptions and costs used in the ampicillin and gentamicin calculation included (1) 80 percent of patients would respond; (2) 15 percent would require additional clindamycin; (3) 5 percent would require 10 days (as opposed to the standard 6) of ampicillin and gentamicin, additional clindamycin, and additional heparin; and (4) a test for blood urea nitrogen and a urinalysis. Treatment assumptions and costs used in the clindamycin and gentamicin calculation included (1) 90 percent of patients would respond; (2) 5 percent would require additional ampicillin; (3) 5 percent would require 7 days (as opposed to the standard 6) of clindamycin and gentamicin, additional ampicillin, and additional heparin; and (4) a test for blood urea nitrogen and a urinalysis. Treatment assumptions and costs used in the cefoxitin calculation included (1) 90 percent of patients would respond; (2) 5 percent would require additional clindamycin; and (3) 5 percent would require additional clindamycin, ampicillin, and heparin. Moxalactum and cefazolin intravenous prophylaxis had no special assumptions. A summary of costs to patients of each treatment plan (i.e., bed charges, drug costs, laboratory tests, and pharmacology consultation costs) gives the cost per patient versus the average cost of infection: Ampicillin/gentamicin, \$1,243 versus \$881; clindamycin/gentamicin, \$1236 versus \$859; cefoxitin, \$1,109 versus \$503; moxalactan, \$1,194 versus \$743. For cefazolin intravenous prophylaxis, all infections treated with ampicillin and gentamicin cost \$1,135; all infections treated with cefoxitin, \$1,059. Cost of the drug alone on a per gram, per dose, or per day of therapy

basis was not an accurate way to estimate the cost eventually paid by the patient. The therapeutic efficacy, frequency of administration, and need for ancillary services for each treatment regimen significantly affect the patient's costs. Researchers conclude that (1) antibiotic prophylaxis is clearly cost-effective for patients who are at increased risk of postcesarean section infection and may even be so for all women who have cesareans; (2) the least expensive drugs do not necessarily result in the lowest cost for the patient; and (3) the high cost of peripartum infectious morbidity should prompt renewed attention to antepartum and intrapartum nonpharmacologic methods of preventing infection in these patients. 2 tables, 9 references.

242

Economic Incentives in the Choice Between Vaginal Delivery and Cesarean Section.

Form: Journal article.

Author: Keeler, E.B.; Brodie, M.

Source: *Milbank Quarterly*.

71(3):365-404, 1993.

Abstract: Within the context of an economic model of obstetric decision making, researchers discuss the prevalence and the effects of economic incentives in the choice between vaginal delivery and cesarean section. A 1989 U.S. survey found that the average charge for a cesarean section was \$2,850 greater than the average for a vaginal delivery (Health Insurance Association of America, 1989). Although most of the price difference can be traced to the 2 to 3 extra days of inpatient care, the average physician fee for a cesarean section was more than \$500 greater than the fee for a vaginal delivery. Ignoring financial costs, a cesarean section is best if the price in terms of morbidity and risk to mother of the operation is less than the discomfort and risks to the mother and child of a prolonged

vaginal delivery. Economic incentives and choices exist among physicians, hospitals, health maintenance organizations (HMO's), insurers, and expectant mothers. The rise in malpractice premiums has contributed to the shift to more cesarean sections. There are also opportunity costs of waiting for labor to progress depending on the expected length of labor and on physicians' ability to structure their practice to make efficient use of that time. The 1992 direct cost estimates in the U.S. were \$809 for the package of prenatal and postnatal care and vaginal delivery, and \$1,066 for the total cesarean package. The 1989 survey by the Health Insurance Association of America showed that physician charges for cesarean section in 1989 were \$2,053 compared with \$1,492 for vaginal delivery. In 1986, average Medicaid reimbursement for vaginal delivery was \$554, and for cesarean section was \$767. The percentage markup for cesarean section is similar to private insurance. Private insurance pays physicians the highest fees and has the highest rates of cesarean sections. Cesarean section rates in HMO's are comparable to private insurance rates; however, salaried HMO physicians have no financial incentive to manage deliveries. Self pay and indigent mothers have the lowest rates of cesarean section. The effects of competition on obstetricians include (1) a low fertility rate as the baby boomers near the end of their childbearing years, (2) an increase in the supply of obstetricians per population, (3) a homogenous package-type pricing structure, (4) growing interest in natural births, and (5) increased use of HMO's. The treatment decision may be affected indirectly by incentives to use tests and procedures that are complementary to cesarean section, e.g., electronic fetal monitoring. Hospital incentives are similar to those of obstetricians since they also profit more from cesarean sections and they have to balance immediate gains against reputation. Obstetric services are

expensive because of the unpredictable nature of labor and economies of scale. The cost per day of obstetrics cases exceeded the average by \$275 to \$600 in the New York City area because obstetric cases used nursing staff and the delivery or operating room heavily and the lengths of stay were short. Hospital charges for C-section averaged \$5,133 in contrast to \$2,842 for vaginal delivery. When physician fees of \$1,492 for vaginal delivery and \$2,053 for cesarean were added, the cesarean section total of \$7,196 was 66 percent more expensive than the vaginal delivery total of \$4,334.

HMO's and managed care insurance plans have incentives to minimize the cost of services, but they must provide adequate care to preserve their reputation. Obstetrician-midwife teams save money inside and outside of the HMO setting. Telephone surveys and cost analysis in an HMO revealed that (1) maternity patients accepted midwife care despite little prior knowledge of midwives; (2) the midwife reduced inpatient costs, but not costs associated with prenatal care; (3) use of a midwife did not affect perinatal outcomes; and (4) physicians and midwives can work together as teams. Mothers' incentives include financial costs and preferences for care. In a 1989 insurance survey, one-third of the people with work-related group insurance were in an HMO or preferred provider organization and two-thirds had conventional insurance. The median out-of-pocket limit was \$1,000; only 20 percent with a limit greater than \$2,000 would be likely to pay 20 percent coinsurance on the full \$3,000 of difference. Because of limited resources to pay for the care of mothers who are on Medicaid or who are uninsured, mothers, physicians, and hospitals all have incentives to keep costs down. Consequently, the cesarean rates of the indigent or those on Medicaid are low. In the United States and abroad, most studies have found a correlation between income and cesarean rates. The authors suggest that, to make more informed decisions and have better

management of childbirth and insurance reform, everyone needs better estimates for the true health, satisfaction, and financial costs of labor and postpartum morbidity following vaginal delivery and cesarean section.

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Reducing the Incidence of Infection After Caesarean Section: Implications of Prophylaxis With Antibiotics for Hospital Resources.

Form: Journal article.

Author: Mugford, M.; Kingston, J.; Chalmers, I.

Source: *British Medical Journal*.
299(6706):1003-1006, October 21, 1989.

Abstract: Researchers sought to estimate the cost effectiveness of routinely giving prophylactic antibiotics to reduce the incidence of wound infection after cesarean section. They based estimation of cost effectiveness on a retrospective overview of 58 controlled trials and on evidence about costs derived from data and observations of practice. Trials included in the overview were from obstetric units in several different countries, including England. Other participating countries were not named in the source document. The costing study was based on data from the John Radcliffe Maternity Hospital, Oxford, England. A total of 7,777 women were included in the 58 controlled trials comparing the effects of giving prophylactic antibiotics routinely at cesarean section with either treatment with a placebo or no treatment. Cost estimates were based on data on 486 women who had cesarean sections between January and September 1987. Researchers found that the chance of wound infection is likely to be reduced by about 50-70 percent by giving antibiotics routinely at cesarean section. Forty-one women who had cesareans were coded by the Oxford obstetric data system as

having developed wound infection (8.4 percent). The additional average cost of hospital postnatal care for women with wound infection (compared with those who had cesareans but no infection) was estimated at 716 pounds; introducing routine prophylaxis with antibiotics would reduce average costs of postnatal care by between 1,300 pounds and 3,900 pounds per 100 cesareans (at 1988 prices), depending on the cost of the antibiotic and its effectiveness. Results suggest that giving antibiotics routinely at cesarean section will not only reduce rates of infection after cesarean but also reduce costs. 3 tables, 17 references.

244

Cesarean Delivery for Women Presenting With Genital Herpes Lesions: Efficacy, Risks, and Costs.

Form: Journal article.

Author: Randolph, A.G.; Washington, A.E.; Prober, C.G.

Source: *Journal of the American Medical Association.* 270(1):77-82, July 7, 1993.

Abstract: Researchers assessed the effect of cesarean delivery on neonatal and maternal morbidity and mortality and their associated costs for two populations of women with genital herpes simplex virus (HSV) and recurrent HSV type 2 (HSV-2) lesions at delivery: (1) Those with a history of genital herpes, and (2) those without a history of genital herpes. Researchers created a model of maternal-to-neonatal transmission using decision analysis concepts, varying the preventive efficacy of cesarean delivery, and establishing ranges and probabilities from medical literature. In comparison with a baseline nonintervention strategy of standard delivery for all women in the cohort, investigators examined (1) the number of cesarean deliveries performed solely because

of the presence of active genital herpetic lesions, and (2) the number of neonatal infections resulting after cesarean delivery for all women in each population. Estimations of lesions and viral shedding at delivery were derived from measuring (1) the prevalence of genital HSV-2 in pregnant women, (2) the incidence of HSV-2 infection in pregnant women, (3) lesions at delivery, and (4) shedding of HSV at delivery. Researchers used a 20 percent seroprevalence rate of HSV-2 antibodies to estimate the prevalence of HSV genital infections for 1 million women delivering annually and 75 percent for asymptomatic infection, and 25 percent for symptomatic infection. Researchers estimated (1) a baseline rate of 0.07 percent for rate of acquisition of HSV-2 in pregnant women (range of 0.045 to 0.1 percent); (2) that approximately 70 percent of women with primary symptomatic outbreaks in the last 28 days of delivery would still have lesions present at delivery without antibodies; (3) that of women with first-episode nonprimary infections, 44 percent would excrete virus from a lesion at delivery; and (4) that of women with first-episode primary infection, 60 percent of women would excrete virus from a lesion at delivery. Researchers estimated maternal and neonatal outcomes through examining (1) transmission rates from mother to neonate, baseline 50 percent and range 20 to 80 percent; (2) neonatal HSV infection, 43.8 percent; (3) rate of cesarean delivery, baseline 15 percent; (4) morbidity from cesarean delivery, 28.5 percent; (5) mortality from cesarean delivery, .015 percent; and (6) the efficacy of cesarean delivery in preventing neonatal HSV infections, 80 percent. Researchers used the Binkin and Koplan method to analyze the costs and benefits between cesarean and vaginal deliveries. The difference in cost, including complications, is \$3,725, per patient adjusted using the Consumer Price Index for Medical Care. The extra cost for hospital care was estimated at

\$25,000 per neonatal herpes infected patient. The estimated lifetime cost of long-term care for a severely disabled child requiring institutionalization is \$250,000 and \$125,000 for a moderately disabled child requiring home assistance. Long-term costs were discounted at a rate of 4 percent per year. The cost-utility ratio was used to determine quality-adjusted life-years (QALY) discounted at 4 percent per year. In women with a history of recurrent genital HSV, cesarean delivery prevents 9 neonatal infections per 1 million births at a cost of 5,979 excess cesarean deliveries and one maternal death. The total cost of cesarean delivery as a strategy to prevent neonatal HSV transmission from women with recurrent genital HSV lesions at delivery is more than \$2.5 million per case of neonatal HSV averted, with a cost of \$203,000 per QALY gained. The cost per case of neonatal HSV averted for women with genital HSV lesions at delivery who have no history of genital HSV is a saving of \$38,000 with a saving of \$2,600 per QALY gained. Since cesarean delivery for women with no history of genital herpes simplex virus who have lesions at delivery has low maternal costs per neonatal benefit and saves money, women who present with their first clinical episode of genital herpes at delivery should have a cesarean section performed. However, the current practice of genital herpes at delivery for women with a history of genital herpes lesions that recur at delivery results in high maternal morbidity and mortality at substantial financial expense, underscoring the urgency of examining alternative management strategies.

2 figures, 3 tables, 37 references.



Maternal Health

Preterm Labor, Placenta Previa, and Cerclage

245

Preterm Premature Rupture of Membranes: A Randomized Study of Home Versus Hospital Management.

Form: Journal article.

Author: Carlan, S.J.; O'Brien, W.F.; Parsons, M.T.; Lense, J.J.

Source: *Obstetrics and Gynecology*.

81(1):61-64, January 1993.

Abstract: Researchers compared length of latency period, gestational age at delivery, and safety in a carefully selected group of women with preterm premature rupture of the membranes (PROM) randomized to home versus hospital management. Study subjects were 55 women admitted to Tampa (Florida) General Hospital between March 1989 and March 1991 who had preterm PROM (before 37 weeks' gestation) and had not entered labor within 72 hours after rupture. Subjects gave informed consent to their participation and were limited to women with (1) a singleton gestation, (2) no clinical evidence of intra-amniotic infection, (3) cephalic presentation, (4) at least one vertical pocket of amniotic fluid greater than 2 cm, (5) cervical examination estimated at less than 4 cm dilation by inspection, and (6) Hillsborough County residency. After 72 hours of hospital care, physicians randomized subjects to either home or hospital management. The two groups underwent nearly identical surveillance that included staying in bed with pelvic rest and periodic rescanning. Health professionals recorded oral temperature and pulse every 6 hours and charted fetal movements. Researchers collected information from weekly nonstress tests, blood tests, ultrasound tests, and sterile speculum examination. Data

analysis indicated there were no significant differences in clinical characteristics, perinatal, or neonatal outcome between the groups. There was a significant difference in total maternal charges, with the home management group having lower costs. 5 tables, 14 references.

246

Conservative Management of Placenta Previa: A Cost-benefit Analysis.

Form: Journal article.

Author: D'Angelo, L.J.; Irwin, L.F.

Source: *American Journal of Obstetrics and Gynecology*. 149(3):320-326, June 1, 1984.

Abstract: Researchers compared an outpatient expectant mode of managing placenta previa with a more aggressive, inpatient expectant mode over a relatively short time period within a single institution. From July 1979 to December 1981, researchers reviewed the records of a community-based tertiary care hospital for cases of placenta previa. Cases selected for analysis were those that required cesarean section and met strict criteria. Researchers were able to separate patient care into two distinct management groups. The 18 outpatient subjects had bed rest at home, office followup, and hospitalization for significant bleeding episodes. The 20 inpatient subjects rested in the hospital until delivery and received fetal monitoring, drugs, and blood transfusions when necessary. Researchers collected maternal data regarding age, gravidity, obstetric gestational age at first bleeding and at delivery, days of hospitalization, and units of blood transfused. Neonatal data included gestational age,

birthweight, Apgar scores, neonatal hospital days, and neonatal morbidity and mortality. Data analysis indicated the aggressive inpatient expectant protocol resulted in statistically significant improvement in perinatal outcome as compared with the outpatient expectant regimen. Inpatient group infants had a mean of nearly 2.5 weeks greater estimated neonatal gestational age than outpatient group infants. There were two cases of neonatal death in the outpatient expectant group and none in the inpatient expectant group. There were approximately 12 fewer hospital days for neonates in the inpatient expectant group compared to those in the outpatient group and 12 additional hospital days for inpatient mothers compared to outpatient mothers. Analysis revealed that the twofold increase in maternal hospital costs in the inpatient group is counterbalanced by a nearly threefold increase in neonatal care costs in the outpatient expectant group. Overall hospital costs for maternal-neonatal pairs were 69 percent higher in the outpatient expectant group. 3 tables, 7 references.

247

Cost Effectiveness of Stopping Preterm Labor With Beta-Adrenergic Treatment.

Form: Journal article.

Author: Korenbrot, C.C.; Aalto, L.H.; Laros, R.K.

Source: *New England Journal of Medicine.* 310(11):691-696, March 15, 1984.

Abstract: Researchers retrospectively compared the costs of maternal and neonatal medical care after beta-adrenergic drug treatment (given to arrest preterm labor) with expected costs associated with no gestational delay. Preterm labor was defined as occurrence of contractions leading to cervical change or premature rupture of the membranes between the 20th and 37th weeks of

pregnancy. Researchers studied a total of 411 patient records from one hospital. Analysis showed that the treatment arrested labor for at least 3 days in 61 percent of patients; gestation was extended by approximately 14 weeks in infants with the earliest gestational age at treatment (20-25 weeks) and by approximately 2 weeks in those with the latest gestational age (36-37 weeks). Researchers based costs on hospital charges and physicians' fees, including high-risk obstetric outpatient charges, obstetric prenatal and delivery inpatient charges, and pediatric inpatient charges. Treatment provided between 26-33 weeks of gestation was clearly cost effective, resulting in expected savings of \$11,240 (1981 dollars) per birth. After 33 weeks there was no substantial difference in expected costs with or without treatment. Between 20-25 weeks of gestation, expected costs per surviving infant were \$39,000 lower with treatment than without treatment; however, the number of mothers who were not treated at this early stage of gestation (three patients) was too small to permit statistical significance. When researchers considered the improved survival of infants after prenatal treatment, treatment before 25 weeks was also cost effective. For labor at 20 to 25 weeks of gestation, the mean maternal charges for patients receiving treatment were about \$5,000 more than charges for patients who were not receiving tocolytic drugs. Since premature infants have a lower rate of survival, neonatal daily charges between infants of 20 to 25 weeks of gestation were high (\$1,220), but their mean hospital stay was short (6 days) giving the impression that these neonatal charges did not differ from those of term births. Results indicate that the increased costs of prenatal medical care were offset by decreased costs of neonatal medical care when treatment was given before 34 weeks of gestation. 2 figures, 5 tables, 10 references.

248

Evaluation of the Cost-Effectiveness of Home Monitoring of Uterine Contractions.

Form: Journal article.

Author: Kosasa, T.S.; Abou-Sayf, F.K.; Li-Ma, G.; Hale, R.W.

Source: *Obstetrics and Gynecology*. 76(1, Supplement):71S-75S, July 1990.

Abstract: The Hawaii Medical Services Association, the major health insurance carrier and Blue Shield fiscal intermediary in Hawaii, initiated a study to determine the cost-effectiveness of ambulatory uterine monitoring. Maternal and neonatal costs were calculated on 79 patients who were at high risk for preterm birth. These risk factors included preterm labor in the current pregnancy, previous preterm labor, previous preterm delivery, multiple gestation, or uterine anomaly. All subjects were placed on the Term Guard uterine monitoring system (produced by Tokos Medical Corporation in Santa Ana, California) between 24 and 36 weeks' gestation. Overall costs were calculated using actual costs for services provided: (1) Ambulatory monitoring costs of \$60 per day, (2) maternal costs for inpatient tocolysis of \$900 per day, and (3) neonatal intensive care unit (NICU) costs of \$1,500 per day. Regression analyses used to calculate the cost of preterm deliveries in the absence of monitoring were derived from 192 patients who were admitted with preterm labor for inpatient tocolysis and who delivered preterm infants during the period study. Cost assumptions for the monitored group were based on preterm delivery rates of actual patients in the institution who had not used the monitor. Subjects in both groups were matched for gestational age at the occurrence of preterm labor. Women on the home monitor recorded uterine activity in two separate, daily 1-hour sessions during which they assumed their routine activities. The uterine activity data were stored and

transmitted after the second monitoring period to a Tokos Perinatal Nursing Center.

Detection of any increased frequency of uterine contractions above a baseline set by the patient's physician was followed by a call to the physician and subsequent evaluation. Subjects were contacted at least once a day and were questioned about any symptoms associated with preterm labor. At the end of the study, 79 patients had completed 3,189 days on the monitor. Thirty-six patients (45.6 percent) did not have preterm labor. The cost of monitoring this group ranged from \$600 to \$700; the daily monitoring resulted in an average loss to the insurance carrier of \$3,300 per patient or \$118,800 total. In contrast, 43 patients (54.4 percent) experienced preterm labor and yielded a cost savings from the home uterine monitor. Earlier detection of preterm labor and better management of oral tocolysis in this group resulted in earlier initiation of maternal tocolytic therapy, which ultimately decreased the preterm birth rate and hospitalization days in the neonatal intensive care unit. Cost analysis of this group demonstrated a decrease in cost ranging from \$500 to \$68,000, with an average savings of \$24,000 per patient, or an overall savings of \$1,032,000. Conservative analysis of the costs of inpatient maternal and NICU care resulted in an average savings per patient 7.2 times larger than the average loss in each subject, or a net savings of \$11,500 per patient. The total group of high-risk patients resulted in a net savings to the insurance carrier of \$913,200, suggesting that the use of the ambulatory uterine activity monitoring system significantly reduced the cost associated with preterm labor and early delivery.

249

Controlled Trial of a Preterm Labor Detection Program: Efficacy and Costs.

Form: Journal article.

Author: Main, D.M.; Richardson, D.K.; Hadley, C.B.; Gabbe, S.G.

Source: *Obstetrics and Gynecology*.
74(6):873-877, December 1989.

Abstract: Between May 1, 1983 and May 30, 1986, researchers assessed the impact of a preterm birth prevention patient education program on 943 indigent African American inner-city women. Patients were women attending the obstetric clinic of the Hospital of the University of Pennsylvania at or before 18 weeks' gestation. A nurse specialist used the Papiernik-Creasy scoring system to assess each patient's risk of spontaneous preterm birth. Researchers randomly allocated 198 high-risk women to a Preterm Labor Detection Clinic (PLDC) and 178 high-risk women to a high-risk control group; 567 women with lower risk scores served as low-risk controls. Starting at 22 weeks' gestation, women in the PLDC program received comprehensive patient education from a nurse specialist and a weekly or biweekly cervical examination from a physician. Women in both control groups were not informed of their status, and both groups received prenatal care in standard obstetric clinics. Overall, women in the two high-risk groups were comparable with respect to age, gravidity, parity, number of previous early and late abortions, previous preterm births, and gestational age at first visit. Results showed no significant differences between the high-risk groups with respect to mean gestational age at delivery, mean birthweight, or percentage delivery before term as a result of preterm labor or premature rupture of membranes (PROM). Evaluations of inpatient charges (\$5,846 for high-risk controls versus \$5,687 for PLDC participants) revealed no significant differences due to

participation in this program, although outpatient clinic use and charges were increased significantly for PLDC patients. The cost per PLDC participant was \$1,125, as compared with \$542 per high-risk control participant. Failure of this program to reduce preterm birth may relate to the relatively low overall rate of women presenting in preterm labor with advanced cervical dilation. High rates of PROM and fetal death occurred in all three study groups. 6 tables, 7 references.

250

Cost/Health Effectiveness of Home Uterine Activity Monitoring in a Medicaid Population.

Form: Journal article.

Author: Morrison, J.C.; Pittman, K.P.; Martin, R.W.; McLaughlin, B.N.

Source: *Obstetrics and Gynecology*.
76(1, Supplement):76S-81S, July 1990.

Abstract: Researchers instituted an intensive system of preterm birth prevention using home uterine activity monitoring in 130 public assistance (Medicaid) patients who were at high risk for preterm birth. Patients were stratified into three groups: (1) Group A patients had not experienced preterm labor before monitoring began and subsequently did not develop preterm labor during the pregnancy; (2) group B patients had no labor before the monitoring began but subsequently did develop an episode of early labor; and (3) group C patients experienced preterm labor, received effective tocolytic therapy, or began this therapy before discharge. A retrospective review of the subjects' pregnancy outcomes was conducted, and these data were exposed to a model for projected patient care cost. The occurrence of preterm delivery for failed tocolysis or advanced cervical dilatation was less than 10 percent. The incidence of preterm labor in the at-risk group was 46 percent. The

mean prolongation from the first episode of preterm labor was 4.9 weeks in group B and 7.4 weeks in group C. Based on a cost-analysis model, the costs of monitoring and actual preterm births for groups A, B, and C were (1) \$417,160; (2) \$399,810; and (3) \$781,090, respectively. The projected charges due to preterm birth that would have occurred if monitoring had not extended the pregnancy for groups A, B, and C totaled (1) \$291,000; (2) \$824,700; and (3) \$3,318,000, respectively. This yielded a projected savings of \$2,835,640 or \$21,813 per patient. 5 tables, 3 figures, 24 references.

251

Cost Effectiveness of Preventing Preterm Delivery in Twin Pregnancies.

Form: Journal article.

Author: Papiernik, E.; Keith, L.G.

Source: *Acta Geneticae Medicae et Gemellologiae*. 39(3):361-369, 1990.

Abstract: As an extension of previous work on the risk of prematurity (delivery at less than 37 weeks' gestation) in singletons and on the social cost of twin births, researchers in France performed an analysis of the cost effectiveness of preventing premature delivery in twin pregnancies, which have an increased rate of premature births. They assessed the cost of prevention in terms of early diagnosis of twin pregnancies through ultrasound screening and of an extra 11 weeks of work leave to expectant mothers of twins. The study specifically looked at very low birthweight (VLBW) infants born at less than 31 weeks and weighing less than 1,500 grams. Statistics show that 10.7 VLBW children (a total of 15.3 children for all birthweights) in every 1,000 births of twins are handicapped. Researchers obtained data from 321 twin deliveries (excluding fetuses less than 500 grams) followed at Hopital Antoine Beclere,

Clamart, France, between 1982-1988. Costs estimated included (1) the cost for a single screening ultrasound of each pregnant woman between 10-20 weeks gestation; (2) work leave if all expectant mothers of twins were employed, by week of work leave beginning at gestation week 24; (3) the cost per neonatal intensive care unit (NICU) hospital day; and (4) approximation of the long-term costs for each handicapped child. One scan in France cost 300 francs (F) (\$50); mean compensation for 1 week of work leave was about 2,000 F (\$333); mean cost for a NICU day was about 6,000 F (\$1,000); and the monetary value of lifelong support of a handicapped person was estimated at about 7,000,000 F (\$1,100,000). When researchers compared the cost of prevention and additional work leave to the social cost involved in the transfer of newborns to NICU's and in supporting handicapped children, they concluded that the total cost of prevention (26,000,000 F or \$4,300,000) corresponds to one-third of the long-term costs associated with lack of prevention (78,000,000 F or \$12,400,000). 7 tables, 16 references.

252

Prolonged Use of Tocolytic Agents in the Expectant Management of Placenta Previa.

Form: Journal article.

Author: Tomich, P.G.

Source: *Journal of Reproductive Medicine*. 30(10):745-748, October 1985.

Abstract: Researchers studied the effects of the prolonged use (greater than 7 days) of tocolytic agents, along with other established procedures of conservative, expectant management, in women with either total or marginal-partial placenta previa. From January 1979-December 1983, 45 patients at the Loyola University Perinatal Center (Illinois) fulfilled study criteria: (1) The

placenta previa was present at the time of delivery; (2) the sole indication for cesarian section was the presence of the placenta previa with a mature infant, excessive bleeding, or other placenta previa complications; (3) patients were hemodynamically stable on admission; (4) vaginal bleeding on admission was less than 50 ml/hr; and (5) the estimated gestational age at admission was less than 37 weeks. Researchers used two regimens of tocolytic agents during the study period. From January 1979-December 1981, researchers administered isoxsuprine until delivery. Starting in January 1981, researchers administered ritodrine until delivery. Prolonged use of the tocolytic agents, along with expectant management, extended the gestational age by more than 21 days in 56.2 percent of the total placenta previa cases and 66.7 percent in the partial-marginal cases. There were no significant differences between the groups that received isoxsuprine and ritodrine. The prolonged use of tocolytics was not associated with any undue side effects requiring discontinuation of the regimen. Three patients had abnormal glucose tolerance tests normalized by diet. The prolonged antepartum maternal hospitalization resulted in an estimated cost savings of \$16,110 for the total placenta previa group and \$20,240 for the marginal-partial group in comparison with the costs if the delivery had occurred on admission (estimated costs of \$51,000 and \$49,300, respectively). 5 tables, 12 references.

253

Therapeutic Efficacy and Cost-effectiveness of Aggressive Tocolysis for Premature Labor Associated With Premature Rupture of the Membranes.

Form: Journal article.

Author: Weiner, C.P.; Renk, K.; Klugman, M.

Source: *American Journal of Obstetrics and Gynecology*. 159(1):216-222, July 1988.

Abstract: Researchers conducted a randomized trial comparing bed rest with tocolysis to determine the therapeutic efficacy, safety, and cost-effectiveness of tocolysis for the treatment of preterm labor after membrane rupture. One hundred-nine women participated over a 26-month interval at the University of Iowa hospital. Sixty percent of the randomized group of women comprised the tocolysis group. Treatment groups did not differ significantly in terms of gestational age at membrane rupture, gestational age at delivery, birthweight, maternal or fetal infectious morbidity, respiratory distress syndrome, necrotizing enterocolitis, or perinatal mortality. Investigators observed an increase in the duration of intrauterine time after onset of uterine contractions in women receiving tocolysis versus those receiving bed rest only ($105.2 +/ - 157$ hours versus $62.1 +/ - 77$ hours). This prolongation was not associated with a significant reduction in the total cost per surviving infant (tocolysis, \$38,593 versus bed rest, \$43,158). The cost difference was artifactual. Women who received tocolysis had a near-significant increase in hospital costs (bed rest, \$4,399; tocolysis, \$4,883; $p = 0.076$) and a significant increase in physician fees (bed rest, \$939; tocolysis, \$1,419; $p = 0.005$). There were no significant cost differences between treatment groups for the neonates for either the hospital or the physician. The number of very premature infants born (less than 28 weeks'

gestation) was unequal in the two groups (12 in the bed rest group and 5 in the tocolysis group) and therefore skewed results. Before 28 weeks' gestation, tocolysis was associated with a significant increase in intrauterine time after onset of regular contractions ($p = 0.05$). However, there was no identifiable perinatal benefit garnered from the additional 5 days. After 28 weeks there were no significant differences between treatment groups in terms of intrauterine time after onset of regular contractions and total cost per surviving infant. Because tocolysis does not improve perinatal outcome and can itself be associated with major maternal morbidity, it should be avoided after 28 weeks' gestation. Before 28 weeks' gestation tocolysis may greatly increase intrauterine time, but the benefit of prolongation is not clear. 1 figure, 7 tables, 15 references.

(3) regional or general anesthesia, (4) cerclage, (5) recovery in the day care unit, (6) bed rest at home for 24-74 hours following surgery, (7) telephone followup, and (8) a chart review of the pregnancy outcome. The inpatients followed the same course as those in the outpatient group, but after surgery, they remained in the postanesthesia care unit under observation for about 1 hour and in the hospital on general rest for several days. Researchers reviewed both groups' charts for outcomes for the mothers and infants. Data analysis indicated 45 outpatients and 48 inpatients completed pregnancy. The fetal outcomes were similar for both groups, with no significant differences in the number of complications (e.g., respiratory problems, low birthweight, and postpartum fetal icterus) for newborn infants. The average cost of the procedure for outpatients was \$546 and for inpatients was \$1,174. 3 tables, 4 references.

254

Safety of Outpatient Cerclage.

Form: Journal article.

Author: Wetchler, B.V.; Brick, J.

Source: *Journal of Reproductive Medicine*.
35(3):243-246, March 1990.

Abstract: Researchers compared anesthesia techniques and maternal and fetal outcomes in 101 women who underwent scheduled McDonald cerclage for cervical incompetence. Researchers examined (1) 50 outpatients prospectively and (2) 51 inpatients retrospectively and concurrently. All subjects had histories of at least one pregnancy loss in the second trimester and were found to have dilation of the cervix without contractions during the current pregnancy. All subjects underwent cerclage as an elective procedure between the thirteenth and twenty-fifth week of pregnancy. The outpatients underwent (1) sonography, (2) preoperative laboratory determinations and anesthesiology assessments,

Maternal Health

Economics and Prenatal Care

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Costs of Normal Births: Regional Variations, 1986.

Form: Journal article.

Author: Anon.

Source: *Statistical Bulletin Metropolitan Insurance Company.* 69(4):24-32, October-December 1988.

Abstract: An estimated \$16 billion was spent on maternity care costs in the United States in 1986, when maternity care for an uncomplicated delivery of a normal infant cost an average of \$2,923. The highest average charge for normal delivery was in the Pacific division of Metropolitan Insurance Company, at \$3,470. The Middle Atlantic division had the second highest charges, followed by the New England states. The states in the middle of the country registered the lowest delivery costs for a normal delivery. Between-state costs varied by as much as 135 percent. The highest total charge (\$4,210) was in the District of Columbia, and the lowest (\$1,790) was in North Dakota. The average physician cost for a normal birth was \$1,210 across the country. Actual hospital charges averaged \$1,690 and differed by as much as 57 percent among states. Hospitals in the South, including Mississippi, Tennessee, Alabama, Arkansas, and Georgia, charged the highest ancillary fees (laboratory, X rays, delivery room charges, etc.), ranging from 74-79 percent of the hospital bill (the average was 64 percent nationwide). Metropolitan areas tended to have higher total and component health care costs than nonmetropolitan areas, and the charges for a variety of common surgical procedures are higher in California than in almost any other state. These

differences have been attributed to a number of factors, including the availability of newer and more sophisticated diagnostic and treatment tools, the socioeconomic and demographic composition of the area, medical care consumption preferences, the tendency for greater use of less expensive general practitioners in rural areas, the greater use of specialists in urban areas, and possibly also malpractice premiums. 2 figures, 2 tables, 6 references.

256

Outreach as Case Finding: The Process of Locating Low-Income Pregnant Women.

Form: Journal article.

Author: Brooks-Gunn, J.;

McCormick, M.C.; Gunn, R.W.; Shorter, T.; Wallace, C.Y.; Heagarty, M.C.

Source: *Medical Care.* 27(2):95-102, February 1989.

Abstract: Researchers document the process of case finding to enroll women in prenatal care in an urban, disadvantaged community. The following assumptions were made concerning the outreach: (1) Community networks are the source of many referrals to the health care system, (2) indigenous workers are more likely to locate pregnant women than are middle-class service providers, and (3) community workers would be more likely to canvass the neighborhoods than would clinic workers who have become accustomed to being in the clinic. Between 1982-1983, two full-time and two part-time female community residents (all without white-collar work experience or current employment) searched for pregnant women for 1 year in Central

Harlem, receiving a salary and a \$10 commission for each woman they found who enrolled for antenatal care. To document their outreach efforts, the workers kept daily logs of their activities and participated in debriefing sessions. From the logs, researchers abstracted information on (1) time actually spent searching for pregnant women, (2) search strategies, (3) individual differences in search strategies, and (4) effort expended to locate pregnant women. Results indicated outreach workers spent more than half of their time in the field, contacted 20-25 women per day, and used a variety of strategies to locate women. Welfare offices and clinic settings were the locations where the outreach workers spent the most time, followed by apartment buildings and the streets. Strategies included advertising the program via flyers (emphasizing the free health care and stressing the need to take care of the baby's health) that were placed all around the community. A total of 52 women entered the Harlem Hospital Medical Center health care system through the outreach process, with outreach workers identifying 104 pregnant women not already receiving prenatal care. Based on results of the process analysis, recommendations for improving the outreach process include (1) selecting workers who enjoy acting on their own initiative, are able to supervise themselves, and have the perseverance to continue in the face of constant rejection; (2) providing workers with formal training in selling; and (3) providing quick and continuous feedback and incentives to maintain motivation. The cost of the outreach effort was approximately \$44,000. 1 table, 25 references.

257

Evaluation of the Impact of Maternity Care Coordination on Medicaid Birth Outcomes in North Carolina.

Form: Journal article.

Author: Buescher, P.A.; Roth, M.S.; Williams, D.; Goforth, C.M.

Source: *American Journal of Public Health*. 81(12):1625-1629, December 1991.

Abstract: Researchers assessed the effect of maternity care coordination services on birth outcomes in North Carolina, in 1988 and 1989, by comparing women on Medicaid who did and who did not receive such services. The study linked health program data files, including Medicaid claims paid for maternity care coordination, to 1988 and 1989 live birth certificates. Researchers compared very-low-birthweight, low-birthweight, infant mortality, and newborn medical care costs. They examined the effect of maternity care coordination on prenatal participation in the Special Supplemental Food Program for Women, Infants and Children (WIC). Researchers matched birth records to claims paid for maternity care coordination to identify births that required the service. Researchers summarized prenatal visit records from the public health department client information system and matched them to the birth records to identify those births that received prenatal clinic care in health departments. Linking birth records identified women receiving WIC service during the prenatal period. Linking death records to birth cohorts provided statistics on infant mortality rates. Data analysis indicated maternity care coordination was effective in reducing low birthweight, infant mortality, and newborn medical care costs among babies born to women in poverty. Women on Medicaid with maternity care coordination were significantly more likely to

receive WIC services than those without the maternity care coordination. 5 tables, 7 references.

258

Paying for Maternity Care in the United States.

Form: Journal article.

Author: Gold, R.B.; Kenney, A.M.; Singh, S.

Source: *Family Planning Perspectives*. 19(5):190-193, 195-206, September-October 1987.

Abstract: Researchers illustrate how the current system of programs and policies through which maternity care is financed in the United States has left 14.6 million women of reproductive age uncovered by private or public insurance programs for maternity care, and make suggestions about how to improve the situation. Some 3.7 million women, many of them young and with modest incomes, have a baby each year. About 8 women in every 100,000 die from complications associated with childbearing, and 20 percent of newborns (770,000 annually) are born with a health problem. Thirty-four percent of pregnant women are getting inadequate prenatal care. The average bill for having a baby is estimated at \$4,300; it is \$2,900 even if the pregnancy is uncomplicated, the delivery normal, and the infant is healthy. With complications it can go much higher; a cesarean birth with an extremely immature infant can cost \$27,050. Other topics examined include private health insurance (who has it and what it covers); waiting periods before coverage is effective; government programs such as the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) and Medicaid; federally financed clinics; women without insurance; and uncompensated care. Suggestions are given for improving maternity care financing

and taking the next steps toward better care. Congress and 8 states (Illinois, Maine, Maryland, Massachusetts, Minnesota, New York, Ohio, and Wisconsin) have already taken steps to extend insurance coverage and services to pregnant women and their children. The Alan Guttmacher Institute has suggested further measures; 15 are listed in the article. These include uniform coverage for services, expansion of Medicaid services, giving states incentives to offer health care providers reasonable reimbursement, strengthening community-based services, and improving coordination among public programs providing or financing prenatal care. Researchers conclude that adequate and effective financing of prenatal care would help with the country's current problems and would probably cost society as a whole no more than the current system does. 2 figures, 13 tables, 108 references.

259

Cost Effectiveness of Prenatal Care in Reducing Low Birth Weight in New Hampshire.

Form: Journal article.

Author: Gorsky, R.D.; Colby, J.P.

Source: *Health Services Research*. 24(5):583-598, December 1989.

Abstract: Researchers calculated the cost effectiveness of adequate prenatal care in reducing the low birthweight (LBW) rate for each of three socioeconomic groups of women: (1) Those with less than 12 years of education, (2) those with 12 years, and (3) those with more than 12 years. Researchers used data on prenatal care, birthweight, infant survival, and mother's level of education from birth and death certificates collected by the New Hampshire Bureau of Vital Records and Health Statistics for the 1981-1984 birth cohort. Variables calculated from birth and death

certificate information include prenatal care inadequacy, birthweight, mother's level of education, survival rates of very low birthweight (VLBW; under 1,500 grams) and medium low birthweight (MLBW; 1,500-2,499 grams) at 1 month and 1 year. Researchers analyzed (1) initial hospitalization costs (\$13,616 per low birthweight infant); (2) number of rehospitalized infants (38.3 percent for VLBW infants and 19 percent for MLBW infants); (3) rehospitalization costs (\$372 x 16.2 days for VLBW infants and \$372 x 12.5 days for MLBW infants); (4) number of infants with long-term morbidity (18.9 percent of 1-month survivors); (5) long-term morbidity costs (\$1,405 per year); and (6) total cost of LBW (sum of the costs of initial hospitalization, rehospitalization, and long-term morbidity). Target LBW rates for each group were those actually achieved by New Hampshire women receiving adequate prenatal care within respective education groups. The estimated total cost associated with low birthweight births among the 1981-1984 cohort of New Hampshire resident births was more than \$38 million. With universal adequate prenatal care (estimated to cost \$2.5 million), the LBW costs would be less than \$32 million, resulting in a cost savings of \$4 million (\$1 million a year). For each additional dollar spent on prenatal care, \$2.57 in medical care costs would be saved. 9 tables, 19 references.

260

Prenatal, Delivery, and Infant Care under Medicaid in Three States.

Form: Journal article.

Author: Howell, E.M.; Brown, G.A.

Source: *Health Care Financing Review*.
10(4):1-15, Summer 1989.

Abstract: Researchers analyzed Medicaid services and expenditures for care during the prenatal, delivery, and post-delivery periods in

California, Georgia, and Michigan.

Investigators used uniform data from the Health Care Financing Administration's (HCFA) Medicaid Tape-to-Tape project, 1983-1984, which contains person-based information on all services covered by Medicaid since 1980 in several states. Researchers estimated that the 144,540 Medicaid-financed births in the three states in 1983 represented about 17 percent of all Medicaid births nationally in 1983. Data studied are from 12,045 Medicaid-financed deliveries in the three states in October 1983. Percentages of all births in the states studied that were financed by Medicaid were 16 percent in Georgia, 23 percent in California, and 24 percent in Michigan. More than 50 percent of expenditures for the study population were for delivery hospitalization; less than 12 percent were for prenatal care. Up to 41 percent of total delivery payments were for high-cost deliveries (those over \$4,000). From 33-41 percent of total Medicaid expenditures for Aid to Families with Dependent Children were for pregnancy, delivery, and newborn care in 1983. Average fee-for-service charges and Medicaid payments for prenatal care ranged from \$904 in Michigan to \$454 in Georgia. Average charge per delivery hospitalization ranged from \$2,559 in Georgia to \$4,150 in Michigan. Average total expenditures for care during all three periods were \$3,933 in Georgia, \$4,632 in California, and \$4,816 in Michigan. For the measures observed, the Medicaid programs of these three widely differing states provided very similar care for pregnant women and infants during 1983. 6 figures, 10 tables, 13 references.

261

**Prenatal Care and Low Birthweight:
Effects on Health Care Expenditures.**

Form: Book chapter.

Corporate Author: Institute of Medicine, Division of Health Promotion and Disease Prevention, Committee to Study the Prevention of Low Birthweight.

Source: IN: *Preventing Low Birthweight*. Washington, DC, National Academy Press, pp. 212-237, 1985.

Availability: National Academy Press, 2101 Constitution Avenue, NW., Washington, DC 20418.

Abstract: In *Prenatal Care and Low Birthweight: Effects on Health Care Expenditures*, The Committee to Study the Prevention of Low Birthweight attempted to determine prenatal costs by (1) identifying a target population of high-risk pregnant women, (2) estimating additional public fiscal outlays required to provide them with more complete prenatal care services than they currently obtained, (3) assessing direct medical care expenditures resulting from a low-weight birth for 1 year, and (4) comparing the additional public fiscal outlays for adequate prenatal care of the target group mothers with the potential savings in single-year medical care costs that might result from the reduction in low birthweight rate. The target population included the total national cohort of women between ages 15-39 who received public assistance and who had less than 12 years' education (an estimated 1,399,000 women). These women were projected to have 110,601 pregnancies at risk for low birthweight, of which 12,719 would result in a low birthweight infant (an 11.5 percent rate). The committee estimated the cost for professional services associated with prenatal care at about \$400 per infant. The estimated cost for a newborn's hospitalization in neonatal intensive care was \$13,616 (adjusted to 1984 dollars);

for rehospitalization in the first year, \$372. The committee calculated that an additional \$12 million would be required to provide the target population of high-risk women with prenatal care beginning in the pregnancy's first trimester. If only a 10 percent low birthweight rate were achieved by providing prenatal care to high-risk pregnant women, total initial hospitalization costs would be \$150.6 million, a cost savings of \$22.6 million. At a 10 percent low birthweight rate, rehospitalization cost savings are projected at \$1.6 million. Providing this population with increased prenatal care services would cost more initially, but would decrease the overall fiscal outlays of governmental agencies for the care of low birthweight infants born to high-risk women. 1 figure, 10 tables, 42 references.

262

Medicaid Expenditures for Maternity and Newborn Care in America.

Form: Journal article.

Author: Kenney, A.M.; Torres, A.; Dittes, N.; Macias, J.

Source: *Family Planning Perspectives*. 18(3):103-110, May-June 1986.

Abstract: The Alan Guttmacher Institute (AGI) conducted a survey to determine (1) 1985 Medicaid expenditures for maternity care and neonatal intensive care given to critically ill newborns; and (2) the number of women receiving public funding in 1985 for prenatal, postnatal, and delivery care on a state-by-state basis. In November 1985, AGI contacted the head of the agency administering the Medicaid program in each of the 50 states and the District of Columbia, requesting the total number of Medicaid patients obtaining prenatal, postnatal, and delivery services and the expenditures for these services. Most states provided information for 1985 fiscal

year or calendar year. Data provided for more than 1 year were annualized. Thirty-five states and the District of Columbia provided aggregate data on maternity care or at least one component of maternity care (usually physician services); an additional seven states furnished information on reimbursement rates. Eighteen states provided acceptable data on neonatal intensive care. Estimates were made for the eight states that provided no information by applying state reimbursement rates to use data. Results showed that approximately 542,000 low-income women have a Medicaid-subsidized delivery each year. The federal and state governments spend almost \$1.2 billion annually for maternity care (including prenatal, postpartum, and newborn care). Medicaid pays for about 10 percent of the nation's maternity care bill, although it subsidizes deliveries for about 15 percent of all women who give birth. Only the highest payments under Medicaid (e.g., Tennessee's \$3,500) are close to the charges for maternity care in the open market, resulting in a significant disinclination for physicians and hospitals to accept Medicaid patients. Medicaid payments for neonatal intensive care average about \$11,800 per infant. Although only about 6 percent of all newborns whose deliveries are subsidized by Medicaid require neonatal intensive care, the care adds about 30 percent to all Medicaid expenditures for maternity care.

263

Prenatal Care and the Low Birth Weight Infant.

Form: Journal article.

Author: Leveno, K.J.; Cunningham, F.G.; Roark, M.L.; Nelson, S.D.; Williams, M.L.

Source: *Obstetrics and Gynecology*.

66(5):599-605, November 1985.

Abstract: Researchers assessed human and economic consequences of low birthweight linked to lack of prenatal care for indigent women. During a 6-month period, researchers collected data on women delivering babies at a Texas hospital, noting those who did and did not seek prenatal care at the clinic. Researchers collected and computerized maternal and infant data prospectively. Maternal data included (1) maternal age, (2) race, (3) parity, (4) gestational age, (5) route of delivery, and (6) pregnancy complications. Infant data included (1) sex, (2) birthweight, (3) Apgar scores, (4) neonatal morbidity, (5) mortality, (6) length of stay in the neonatal intensive care unit, and (7) hospital charges. To assess costs, researchers retrieved computer-generated hospital bills. The study excluded physician fees but included patient charges for (1) daily nursery board, (2) medications, (3) procedures, (4) laboratory tests, (5) x-rays, and (6) operating room time. Data analysis indicated that 4,619 women delivered 4,653 babies during the study period. A total of 84 percent of the women obtained prenatal care. The perinatal mortality for those without prenatal care was 73 per 1,000 compared to 16 per 1,000 in women with prenatal care. Women who sought prenatal care had significantly decreased incidence of low birthweight infants compared to those who did not seek prenatal care. Low birthweight infants born to women with prenatal care had significantly better perinatal survival and less frequent respiratory distress and intraventricular hemorrhage. Infants born to

clinic mothers used fewer neonatal intensive care days and had shorter hospitalizations. Failure to obtain prenatal care related to a 50-percent increase in cost per infant. In this study, the largest neonatal costs incurred for an infant were in excess of \$150,000, and costs in excess of \$100,000 were not uncommon. Given 3.5 million annual births, of which 6 percent were low birthweight, and the 3 percent of mothers who did not receive prenatal care, excess neonatal intensive care in 1984 dollars approached \$75 million. 2 figures, 6 tables, 31 references.

264

**Blessed Events and the Bottom Line:
Financing Maternity Care in the United
States.**

Form: Monograph.

Corporate Author: Alan Guttmacher Institute.

Author: Lincoln, R.; Johnson, J.H.; eds.

Source: New York, NY, Alan Guttmacher Institute, 59 p., 1987.

Availability: Alan Guttmacher Institute, 111 Fifth Avenue, New York, NY 10003. (212) 254-5656.

Abstract: Blessed Events and the Bottom Line: Financing Maternity Care in the United States presents facts and statistics on the current system of financing maternity care and discuss how it leaves approximately 15 million women of reproductive age uncovered by private or public insurance programs for such care. Chapters include (1) Introduction; (2) Having a Baby in America; (3) Paying for Maternity Care (Private Health Insurance, Government Programs, and Women Who Have No Insurance); and (4) Conclusions and Recommendations. Details include demographic information, sources of information, and implications presented in tables, graphs, and illustrations. The typical

pregnant woman in the United States has a family income of \$20,000. Pregnancy expenses account for 20 percent of a year's income on average (the average bill is \$4,300). Families having babies are usually young, just starting careers, or employed in low-paid service or part-time work. Twenty-seven percent of hospital admissions are for delivery, yet the continuing preventive care needed for maternity care is not the aim of most crisis-oriented health insurance plans. Government coverage includes CHAMPUS insurance for civilian dependents of the military (1 million women) and Medicaid insurance primarily for those on welfare (4 million women). Twenty-six percent of women of reproductive age have no maternity coverage; many become eligible when they get pregnant, leaving 15 percent uninsured. A total of 550,000 deliver each year at public expense; they are more likely to be poor, black, teenage, or unmarried, and to have had little or no prenatal care.

Recommendations include legislation to fund prenatal care for all who need it; finding a way to remove the stigma felt by Medicaid recipients; and coordinating existing programs or providing a system of consistent prenatal, obstetric, and infant care nationally. The only new expense would be relatively inexpensive early prenatal care. 24 figures, 113 references.

265

Research Bulletin: The Cost of Maternity Care and Childbirth in the United States, 1989.

Form: Report.

Author: Minor, A.F.

Source: Washington, DC, Health Insurance Association of America, 12 p., 1989.

Availability: Health Insurance Association of America, P.O. Box 41455, Washington, DC 20018.

Abstract: In 1989, the Health Insurance Association of America (HIAA) conducted a survey to determine the cost and cost-related issues of maternity and newborn care, including prenatal care, hospitalization, and other medical expenses for mother and infant. Researchers surveyed 173 community hospitals, 70 childbirth centers, and 153 licensed midwives. Researchers tabulated data based on an average 2-day stay for a normal delivery and a 4-day stay for a cesarean delivery in metropolitan and nonmetropolitan areas according to four United States geographical regions, Northeast, South, Midwest, and West. Results indicated that (1) the cost per person in the United States for a normal pregnancy and delivery averages \$4,334; (2) the average national hospital cost for a normal delivery, excluding physicians' and other practitioners' fees is \$2,842; (3) the average cost of a midwife's services is \$994; (4) cesarean section costs an average of \$7,186 (\$5,133 for hospital charges, and \$2,053 for physicians' fees); (5) a normal delivery based on a one-day stay in a birth center costs \$2,111; (6) a one-day stay in a hospital costs \$3,233; (7) amniocentesis is the diagnostic procedure most frequently performed on pregnant women; and (8) five of the commercial health insurers that write the largest volume of group coverage in the United States paid \$1.4 billion in maternity care claims. Birth centers comprise less than 0.5

percent of all deliveries and cost on average \$2,111 for a 1-day stay, which includes laboratory tests, childbirth education, home visits, and prenatal and postnatal visits.

Factors that contribute to the increasing cost of maternity care include (1) the overall increase in the cost of health care and the cost-of-living index; (2) increases in cesarean deliveries, 17 percent from 1980 to 1987; (3) changes in maternal age, more adolescents and women in later childbearing years, and subsequent greater risk of a complicated delivery and need for more diagnostic tests; (4) new technologies, such as neonatal intensive care units, which have average daily costs of \$985 per patient and account for approximately 40 percent of uncompensated care; (5) a hostile malpractice environment resulting in an increasing number of diagnostic tests; and (6) the increasing annual loss in revenue by community hospitals for uncompensated care. 2 figures, 7 tables, 10 references.

266

Perinatal and Economic Impact of Prenatal Care in a Low-Socioeconomic Population.

Form: Journal article.

Author: Moore, T.R.; Origel, W.; Key, T.C.; Resnik, R.

Source: *American Journal of Obstetrics and Gynecology*. 154(1):29-33, January 1986.

Abstract: Reductions in publicly funded prenatal care programs from 1981-1984 resulted in an increase in unregistered patient deliveries from 7.8 percent to 14.9 percent of births at the University of California San Diego (UCSD) Medical Center. To assess the economic and perinatal impact of the increasing number of deliveries of women without prenatal care, researchers studied 100 consecutive (UCSD) Medical Center patients with fewer than three prenatal visits. The study matched each patient by age, parity, and

week of delivery with a control patient who received care in a state-funded perinatal project, the Comprehensive Perinatal Program. Researchers reviewed the maternal and newborn medical records of each of the pairs of subjects. Data analysis indicated the provision of prenatal care did not appreciably reduce the incidence of maternal complications or morbidity associated with labor and delivery. However, infants of women with no prenatal care experienced significantly greater perinatal morbidity and mortality, primarily related to increased prematurity. The difference in maternal hospital charges between the no care group and the Comprehensive Perinatal Program patients was small (\$59 higher in the no care group). Neonatal charges, however, were strikingly higher for infants in the no care group (\$3,487 versus \$697 for program patients). The total excess costs for delivery of 400 women receiving no care per year in the study hospital was \$877,600. 5 tables, 15 references.

267

Access to Obstetric Care in Rural Areas: Effect on Birth Outcomes.

Form: Journal article.

Author: Nesbitt, T.S.; Connell, F.A.; Hart, L.G.; Rosenblatt, R.A.

Source: *American Journal of Public Health*. 80(7):814-818, July 1990.

Abstract: Researchers investigated the extent to which local availability of obstetric (OB) services related to perinatal outcomes.

Researchers examined the characteristics of rural communities in which the majority of women delivered at a facility other than their local hospital (outflow). Using outflow as a proxy for access to care, researchers assessed whether there were any differences in the outcome or cost of care for women living in communities with diminished OB access

compared to women who had ready access to local OB care. Researchers used data on all deliveries of women whose primary residence was in a rural area of Washington and who gave birth during 1986. By comparing the place of residence with the location of the hospital of delivery, they determined what proportion of all obstetrical deliveries occurred in facilities outside a woman's local hospital catchment area. They collected hospital discharge data from 33 rural hospital service areas, categorizing the data by the extent to which patients left their local communities for OB care (low outflow and high outflow). Telephone surveys with hospital administrators and directors of nursing determined the availability of OB services in each of the communities and the number and specialty of all physicians providing OB services in each hospital during 1985, 1986, and early 1988. Researchers used diagnosis related groups (DRG's) as proxies for OB outcome (complicated or uncomplicated birth and premature or term neonate). Data analysis indicated women from communities with relatively few OB providers in proportion to number of births were less likely to deliver in their local community hospital than women in rural communities with greater numbers of physicians practicing OB in proportion to number of births. Women from the high outflow communities had a greater proportion of complicated deliveries, higher rates of prematurity, and higher costs of neonatal care than women from communities where most patients delivered in the local hospital. 2 figures, 2 tables, 17 references.

268

Expanding Medicaid Coverage for Pregnant Women: Estimates of the Impact and Cost.

Form: Journal article.

Author: Torres, A.; Kenney, A.M.

Source: *Family Planning Perspectives*.
21(1):19-24, January-February 1989.

Abstract: Researchers estimate 361,000 pregnant women will be newly eligible for Medicaid coverage when all states raise the income ceiling for such coverage to 100 percent of the federal poverty level by 1990, as mandated by Congress. Since the first provision expanding the Medicaid income ceiling, researchers have suggested several methodologies to help states calculate the costs of increasing coverage to 100 percent of poverty. All of them have based their estimates of the size of the newly eligible Medicaid group on data from the annual Current Population Survey, which includes data on the health insurance status of the United States population by sex, age, and poverty status. According to the methodology for projecting the effects of recent Congressional changes in the Medicaid program, about 64 percent of the 361,000 soon-to-be-covered women would be otherwise uninsured, at least for maternity care, and for the rest Medicaid would be the payer of last resort. Some states may choose to cover pregnant women with incomes from 100 percent to 185 percent of poverty. Doing so would make another 552,000 women eligible. Researchers estimate that the overall federal and state expenditures to provide maternity and newborn care (excluding neonatal intensive care) to all newly eligible women below 100 percent poverty to be \$654 million per year, about 87 percent of which would cover services to uninsured women. The federal government would pay about 59 percent of Medicaid expenditures for the newly eligible

women, and the states would pay about 41 percent. 2 tables, 33 references.

269

Does Prenatal Care Decrease the Incidence and Cost of Neonatal Intensive Care Admissions?

Form: Journal article.

Author: Wilson, A.L.; Munson, D.P.;

Schubot, D.B.; Leonardson, G.; Stevens, D.C.

Source: *American Journal of Perinatology*.
9(4):281-284, July 1992.

Abstract: Researchers conducted a study to examine the potential effects of expanded Medicaid coverage for low income women in South Dakota. Statewide birth data for 1983 to 1985 were examined to determine the relationship between prenatal care and admissions to neonatal intensive care units (NICUs) and the related costs. An NICU sample was formed from infants who (1) were discharged live following more than 7 NICU days, (2) were referred to an out of state tertiary center, or (3) died following NICU admission. Inadequate care (no prenatal care, only last trimester care, or less than five visits) was received by 11 percent of the total birth cohort and by 18 percent of the infants in the NICU sample. Infants with inadequate care had a NICU admission rate of 5.10 percent versus 2.86 percent for those with adequate prenatal care. The hospital billings for infants in the NICU sample with inadequate care were significantly higher than were those for infants with adequate care. Assuming that economic resources limit access to prenatal care, the projection can be made that had all women with inadequate prenatal care received Medicaid-covered adequate prenatal care, expenditure for this care would yield more than a two to one return in savings in NICU costs. 2 tables, 22 references.

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R270
Revised Estimate of the Economic Impact of Fetal Alcohol Syndrome.

Form: Journal article.
Author: Abel, E.L.; Sokol, R.J.
Source: *Recent Developments in Alcohol.* 9:117-125, 1991.

R271
Adolescent Pregnancy: Incidence and Cost (Editorial).

Form: Journal article.
Author: Bader, M.
Source: *Journal of the American Medical Association.* 258(14):1890, October 9, 1987.

R272
Cost of Irregular Antibody Screening.

Form: Journal article.
Author: Barss, V.A.; Frigoletto, F.D.; Konugres, A.
Source: *American Journal of Obstetrics and Gynecology.* 159(2):428, August 1988.

R273
Certified Nurse-Midwife Effectiveness in the Health Maintenance Organization Obstetric Team.

Form: Journal article.
Author: Bell, K.E.; Mills, J.I.
Source: *Obstetrics and Gynecology.* 74(1):112-116, July 1989.

R274
Direct Costs of Institutional Care in the United States.

Form: Journal article.
Author: Braddock, D.; Hemp, R.; Howes, R.
Source: *Mental Retardation.* 24(1):9-17, February 1986.

R275
Cost-effectiveness of Cefonicid Sodium Versus Cefoxitin Sodium for the Prevention of Postoperative Infections After Nonelective Cesarean Section.

Form: Journal article.
Author: Briggs, G.G.; Moore, B.R.; Bahado-Singh, R.; Lange, S.; Bogh, P.; Garite, T.J.
Source: *Clinical Pharmacy.* 6(9):718-721, September 1987.

R276
Economic Assessments in Randomized Controlled Trials.

Form: Journal article.
Author: Bulpitt, C.J.; Fletcher, A.E.
Source: *Medical Journal of Australia.* 153(Supplement):S16-S19, August 6, 1990.

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R277

Public Costs and Policy Implications of Teenage Childbearing.

Form: Journal article.

Author: Burt, M.R.

Source: *Advances in Adolescent Mental Health.* 4:265-280, 1990.

R278

Estimates of Public Costs for Teenage Childbearing: A Review of Recent Studies and Estimates of 1985 Public Costs.

Form: Book chapter.

Author: Burt, M.R.; Levy, F.

Source: IN: *Risking the Future: Adolescent Sexuality, Pregnancy, and Childbearing. Working Papers and Statistical Appendixes. Volume II.* Hofferth, S.L.; Hayes, C.D.; eds. Washington, DC, National Academy Press, pp. 264-293, 1987.

Availability: National Academy Press, 2101 Constitution Avenue, NW., Washington, DC 20418.

R279

Prenatal Care: A Small Investment Begets a Big Return.

Form: Journal article.

Author: Cameron, M.

Source: *Business and Health.* 11(6):50-53, May 1993.

R280

Prepaid Versus Traditional Medicaid Plans: Lack of Effect on Pregnancy Outcomes and Prenatal Care.

Form: Journal article.

Author: Carey, T.S.; Weis, K.; Homer, C.

Source: *Health Services Research.*

26(2):165-181, June 1991.

R281

Is Universal Screening for Hepatitis B Infection Warranted in All Prenatal Populations?

Form: Journal article.

Author: Christian, S.S.; Duff, P.

Source: *Obstetrics and Gynecology.*

74(2):259-261, August 1989.

R282

Reproductive Technology: The Price of Progress (Editorial).

Form: Journal article.

Author: Collins, J.A.

Source: *New England Journal of Medicine.* 331(4):270-271, July 28, 1994.

R283

Cost-Benefit Analysis of Autologous Blood Donation in Obstetrics.

Form: Journal article.

Author: Combs, C.A.; Murphy, E.L.; Laros, R.K.

Source: *Obstetrics and Gynecology.*

80(4):621-625, October 1992.

R284

Crisis in Maternity Services (Editorial).

Form: Journal article.

Author: Deitch, R.

Source: *Lancet.* 1(8428):590-591, March 9, 1985.

R285

Allocating Resources.

Form: Journal article.

Author: Drummond, M.F.

Source: *International Journal of Technology Assessment in Health Care.* 6(1):77-92, 1990.

R286

Principles of Economic Evaluation of Health Programmes.

Form: Journal article.

Author: Drummond, M.F.; Stoddart, G.L.

Source: *World Health Statistics Quarterly.* 38(4):355-367, 1985.

R287

Prophylactic Antibiotics for Cesarean Delivery: A Simple Cost-effective Strategy for Prevention of Postoperative Morbidity.

Form: Journal article.

Author: Duff, P.

Source: *American Journal of Obstetrics and Gynecology.* 157(4, Part 1):794-798, October 1987.

R288

Cost-benefit of Mass Prophylaxis With Immune Serum Globulin to Control Waterborne Hepatitis A: A Case Study.

Form: Journal article.

Author: Egoz, N.

Source: *Israel Journal of Medical Sciences.* 22(3-4):277-282, March-April 1986.

R289

Infections Complicating Low-risk Cesarean Sections in Community Hospitals: Efficacy of Antimicrobial Prophylaxis.

Form: Journal article.

Author: Ehrenkranz, N.J.;

Blackwelder, W.C.; Pfaff, S.J.; Poppe, D.; Yerg, D.E.; Kaslow, R.A.

Source: *American Journal of Obstetrics and Gynecology.* 162(2):337-343, February 1990.

R290

Intrapartum Hepatitis B Screening in a Low-risk Population.

Form: Journal article.

Author: Ernest, J.M.; Givner, L.B.; Pool, R.

Source: *American Journal of Obstetrics and Gynecology.* 163(3):978-980, September 1990.

R291

Why Pay Extra for Cesarean-Section Deliveries?

Form: Journal article.

Author: Finkler, M.D.; Wirtschafter, D.D.

Source: *Inquiry.* 30(2):208-215, Summer 1993.

Maternal Health

R292

Management of Term Breech Presentation.

Form: Journal article.

Author: Flanagan, T.A.; Mulchahey, K.M.;

Korenbrot, C.C.; Green, J.R.; Laros, R.K.

Source: *American Journal of Obstetrics and Gynecology.* 156(6):1492-1502, June 1987.

R293

Cost-effective Use of Antibiotic Prophylaxis for Cesarean Section.

Form: Journal article.

Author: Ford, L.C.; Hammil, H.A.;

Lebherz, T.B.

Source: *American Journal of Obstetrics and Gynecology.* 157(2):506-510, August 1987.

R294

Cesarean Section: An Economic Appraisal of Infectious Complications.

Form: Journal article.

Author: Franchi, M.; Salvatore, S.;

Fasola, M.; Balestreri, D.; Scorbati, E.

Source: *Clinical and Experimental Obstetrics and Gynecology.* 20(2):108-110, 1993.

R295

Paying for Maternity Care.

Form: Journal article.

Author: Gold, R.B.; Kenney, A.M.

Source: *Family Planning Perspectives.*

17(3):103-111, May-June 1985.

R296

Evaluation of the Relative Risks of a Trial of Labor Versus Elective Repeat Cesarean Section.

Form: Journal article.

Author: Hadley, C.B.; Mennuti, M.T.;

Gabbe, S.G.

Source: *American Journal of Perinatology.* 3(2):107-114, April 1986.

R297

Cost-Effectiveness of Office Obstetrical Ultrasound in Family Practice: Preliminary Considerations.

Form: Journal article.

Author: Hahn, R.G.; Ho, S.; Roi, L.D.;

Bugarin-Viera, M.; Davies, T.C.;

Rodney, W.M.

Source: *Journal of the American Board of Family Practice.* 1(1):33-38, January-March 1988.

R298

Cost-effectiveness of Present Programs for Detection of Asymptomatic Hypertension in Relation to the Severity of Hypertension and Proteinuric Hypertension.

Form: Journal article.

Author: Hall, M.; Campbell, D.

Source: *International Journal of Technology Assessment in Health Care.*

8(Supplement 1):75-81, 1992.

R299

Community-based Home-care Program for the Management of Pre-eclampsia: An Alternative.

Form: Journal article.

Author: Helewa, M.; Heaman, M.; Robinson, M.; Thompson, L.

Source: *Canadian Medical Association Journal.* 149(6):829-834, September 15, 1993.

R300

Social and Economic Consequences of Teenage Childbearing.

Form: Book chapter.

Author: Hofferth, S.L.

Source: IN: *Risking the Future: Adolescent Sexuality, Pregnancy, and Childbearing. Volume II.* Hofferth, S.L.; Hayes, C.D.; eds. Washington, DC, National Academy Press, pp. 123-144, 1987.

Availability: National Academy Press, 2102 Constitution Avenue, NW., Washington, DC 20418.

R301

Prospective Cost Analysis of Moxalactam Versus Clindamycin Plus Gentamicin for Endomyometritis After Cesarean Section.

Form: Journal article.

Author: Knodel, L.C.; Goldspiel, B.R.; Gibbs, R.S.

Source: *Antimicrobial Agents and Chemotherapy.* 32(6):853-857, June 1988.

302

Prenatal Screening for Hepatitis B (Editorial).

Form: Journal article.

Author: Koplan, J.P.

Source: *Journal of the American Medical Association.* 259(23):3408, June 17, 1988.

R303

Efficacy of Hepatitis B Screening in a Private Obstetrical Population.

Form: Journal article.

Author: Kuller, J.A.; Meyer, M.P.; Leonhard, K.R.; Harger, J.H.

Source: *Journal of Perinatology.* 11(2):164-167, June 1991.

R304

Cost-Effectiveness Analysis of a Simple Micromethod for Hepatitis B Screening in Hepatitis B Virus Control Programmes.

Form: Journal article.

Author: Lansang, M.A.; Domingo, E.; Lingao, A.; West, S.

Source: *International Journal of Epidemiology.* 18(4, Supplement 2):S38-S43, 1989.

R305

Efficacy of Screening for Gestational Diabetes.

Form: Journal article.

Author: Marquette, G.P.; Klein, V.R.; Niebyl, J.R.

Source: *American Journal of Perinatology.* 2(1):7-9, January 1985.

Maternal Health

R306

Cost-Effective Criteria for Glucose Screening.

Form: Journal article.

Author: Marquette, G.P.; Klein, V.R.; Repke, J.T.; Niebyl, J.R.

Source: *Obstetrics and Gynecology*. 66(2):181-183, August 1985.

R307

Premature Rupture of the Membranes: Aggressive Versus Conservative Approach: Effect of Tocolytic and Antibiotic Therapy.

Form: Journal article.

Author: Matsuda, Y.; Ikenoue, T.; Hokanishi, H.

Source: *Gynecologic and Obstetric Investigation*. 36(2):102-107, 1993.

R308

Cost of No Prenatal Care.

Form: Journal article.

Author: Morales, W.J.; Vaughn, B.J.; Diebel, N.D.

Source: *Journal of the Florida Medical Association*. 72(10):852-855, October 1995.

R309

Cost Effectiveness of Ambulatory Uterine Activity Monitoring.

Form: Journal article.

Author: Morrison, J.C.; Martin, J.N.; Martin, R.W.; Hess, L.W.; Gookin, K.S.; Wiser, W.L.

Source: *International Journal of Gynecology and Obstetrics*. 28(2):127-132, February 1989.

R310

Glucose Challenge Testing in Pregnancy.

Form: Journal article.

Author: Neilson, D.R.; Bolton, R.N.; Prins, R.P.; Mark, C.

Source: *American Journal of Obstetrics and Gynecology*. 164(6, Part 1):1673-1679, June 1991.

R311

Costs of Caring for Chronically Ill Children.

Form: Journal article.

Author: Newacheck, P.W.

Source: *Business and Health*. 4(3):18-19, 22-24, January 1987.

R312

Controversial Costs of Cocaine (Editorial).

Form: Journal article.

Author: Page, D.

Source: *Journal of the American Medical Association*. 267(4):507, January 22-29, 1992.

R313

Cost and Quality in the Use of Blood Bank Services for Normal Deliveries, Cesarean Sections, and Hysterectomies.

Form: Journal article.

Author: Palmer, R.H.; Kane, J.G.; Churchill, W.H.; Goldman, L.; Komaroff, A.L.

Source: *Journal of the American Medical Association*. 256(2):219-223, July 11, 1986.

R314

Long-term Experience of General Ultrasound Screening in Pregnancy.

Form: Journal article.

Author: Persson, P.H.; Kullander, S.

Source: *American Journal of Obstetrics and Gynecology.* 146(8):942-947, August 15, 1983.

R315

Should All Pregnant Women Be Screened for Hepatitis B Surface Antigen?

Form: Journal article.

Author: Pesce, A.F.; Crewe, E.B.; Cunningham, A.L.

Source: *Medical Journal of Australia.* 150(1):19-21, January 1, 1989.

R316

Screening and Surveillance of Pregnancy Hypertension: An Economic Approach to the Use of Daycare.

Form: Journal article.

Author: Rosenberg, K.; Twaddle, S.

Source: *Bailliere's Clinical Obstetrics and Gynaecology.* 4(1):89-107, March 1990.

R317

Antenatal Care and Intrapartum Management.

Form: Journal article.

Author: Rush, C.B.; Entman, S.S.

Source: *Current Opinion in Obstetrics and Gynecology.* 5(5):647-651, 1993.

R318

Prevention of Hepatitis B Infection in Newborns Through Mass Screening and Delayed Vaccination of All Infants of Mothers With Hepatitis B Surface Antigen.

Form: Journal article.

Author: Schalm, S.W.; Mazel, J.A.; de Gast, G.C.; Heijtink, R.A.; Botman, M.J.; Banffer, J.; Cerards, L.J.; Zwijnenberg, J.; Fetter, W.; Nuijten, A.; Wladimiroff, Y.W.; Christiaens, G.

Source: *Pediatrics.* 83(6):1041-1048, June 1989.

R319

Evaluation of Elective Repeat Cesarean Section as a Standard of Care: An Application of Decision Analysis.

Form: Journal article.

Author: Shy, K.K.; LoGerfo, J.P.; Karp, L.E.

Source: *American Journal of Obstetrics and Gynecology.* 139(2):123-129, January 15, 1981.

R320

Comparison of Patient-Controlled Analgesia and Epidural Morphine for Postcesarean Pain and Recovery.

Form: Journal article.

Author: Smith, C.V.; Rayburn, W.F.; Karaiskakis, P.T.; Morton, R.D.; Norvell, M.J.

Source: *Journal of Reproductive Medicine.* 36(6):430-434, June 1991.

Maternal Health

R321

Multidisciplinary Program for Promoting Single Prophylactic Doses of Cefazolin in Obstetrical and Gynecological Surgical Procedures.

Form: Journal article.

Author: Smith, K.S.; Quercia, R.A.; Chow, M.; Nightingale, C.H.; Quintiliani, R.; Millerick, J.D.
Source: *American Journal of Hospital Pharmacy.* 45(6):1338-1342, June 1988.

R322

Should All Pregnant Women Be Screened for Hepatitis B Surface Antigen? (Editorial).

Form: Journal article.

Author: Swinton, G.W.
Source: *Medical Journal of Australia.* 150(6):346, March 20, 1989.

R323

Multidisciplinary Approach to Cost Reduction of C-section Prophylaxis.

Form: Journal article.

Author: Todd, M.W.; Benrubi, G.
Source: *Hospital Formulary.* 25(4):446-448, 450, April 1990.

R324

Economic Impact of Porcine Surfactant Replacement (CUROSURF) for Severe Neonatal Respiratory Distress Syndrome.

Form: Journal article.

Author: Tubman, T.; Halliday, H.L.; Normand, C.
Source: *Journal of Perinatal Medicine.* 19(Supplement 1):403-407, 1991.

R325

Routine Hepatitis Screening in Adolescent Pregnancies: Is It Cost Effective?

Form: Journal article.

Author: Wetzel, A.M.; Kirz, D.S.

Source: *American Journal of Obstetrics and Gynecology.* 156(1):166-169, January 1987.

R326

Preterm Birth Prevention in a Rural Practice.

Form: Journal article.

Author: Yawn, B.P.; Yawn, R.A.

Source: *Journal of the American Medical Association.* 262(2):230-233, July 14, 1989.

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327

Spontaneous Abortion in Primary Care: A Report From ASPN.

Form: Journal article.

Corporate Author: Ambulatory Sentinel Practice Network.

Source: *Journal of the American Board of Family Practice*. 1(1):15-23, January-March 1988.

Abstract: The Ambulatory Sentinel Practice Network (ASPN) conducted an observational study of usual primary care of spontaneous abortion. Forty-nine practices in 18 states and 4 Canadian provinces reported and audited 171 spontaneous abortions from November 1982 through December 1983 and March through December 1984. Clinicians reported weekly, using a card designed for rapid completion. A questionnaire was completed retrospectively by two persons in each practice to determine complications experienced at the time spontaneous abortion was diagnosed and in the 30 days following diagnosis of spontaneous abortion. There were 226 spontaneous abortions reported in the 25-month study period. ASPN spontaneous abortion patients were predominantly white, between ages 20-34, and insured. Contrary to recommendation in some texts, 40 percent were managed completely in the office and/or at home, and 51 percent had a dilatation and curettage (D and C). Spontaneous abortions occurring later in pregnancy were more likely to (1) be managed in the emergency room or hospital, (2) receive consultation, and (3) have a D and C. Patients managed with a D and C had a greater frequency of excessive blood loss at diagnosis, but otherwise they did not differ in terms of complications at diagnosis or followup from those who did not. Adverse psychological consequences were subjectively observed by ASPN clinicians in 24 percent of

women, exceeding any other category of complications. Charges for six selected services related to managing spontaneous abortions were estimated at (1) \$88 per spontaneous abortion managed out of hospital without D and C, (2) \$497 per spontaneous abortion managed out of hospital with D and C, (3) \$828 per spontaneous abortion managed in hospital without D and C, and (4) \$1,248 per spontaneous abortion managed in hospital with D and C. Management of all spontaneous abortions in a hospital with D and C, instead of the management observed in this study, could add \$145 million per year to health care expenditures in the United States. 4 figures, 4 tables, 35 references.

328

Impact of an Instant Pregnancy Test Kit on the Operations of a Major Hospital Casualty Department.

Form: Journal article.

Author: Baber, R.J.; Bonifacio, M.; Saunders, D.M.

Source: *Australian and New Zealand Journal of Obstetrics and Gynaecology*. 28(2):134-136, May 1988.

Abstract: Since failure to diagnose ectopic pregnancy in a hospital emergency department may lead to unnecessary admissions and perhaps unnecessary operations, researchers sought to determine the impact of an instant pregnancy test kit on emergency department staff diagnostic accuracy, rates of patient admission to the hospital, operative procedures, and related economic factors. Researchers at the Royal North Shore Hospital of Sydney, Australia, retrospectively examined the records of 100 patients on whom a Tandem Beta HCG test was performed during January-April 1986, and compared them with the

records of 73 patients who received both a Tandem Beta HCG test and a Test Pack Serum HCG instant pregnancy test kit in the same casualty department during January-April 1987. Tandem Beta HCG test performance requires 2 hours and was performed during office hours; the mean time needed to receive pregnancy test results was 1.61 days. The instant pregnancy test requires 3 minutes and was performed 24 hours a day. Results revealed a 100 percent correlation between the Tandem Beta HCG and Test Pack Serum HCG tests. Ectopic pregnancy was diagnosed with increased accuracy in 1987 (8 provisionally diagnosed and 7 surgically proven) compared with 1986 (32 provisionally diagnosed and 5 surgically proven). A total of 24 patients were admitted to the hospital in 1986 who would not have been if they had been known not to be pregnant. Instant pregnancy testing significantly improved the accuracy of provisional diagnoses and appeared to help in reducing the number of surgical procedures performed. Based on an analysis of potential cost savings that may have been achieved in 1986 had the instant pregnancy test been available, a combination of careful clinical assessment plus the appropriate application of an instant pregnancy test kit could result in a total cost saving to the hospital of over \$41,000 per annum. 3 tables, 5 references.

329

Cost of Ectopic Pregnancy Management: Surgery Versus Methotrexate.

Form: Journal article.

Author: Creinin, M.D.; Washington, A.E.

Source: *Fertility and Sterility*.

60(6):963-969, December 1993.

Abstract: Researchers examined the costs associated with the management of ectopic pregnancy (EP) in a local hospital and projected annual potential cost savings of

methotrexate (MTX) therapy. They reviewed records of patients treated for EP in 1991. Surgical professional fees were \$1,647 per case; other direct costs were determined from billing statements. Indirect costs, such as lost productivity, were estimated based on published data indicating the likelihood of employment and average salary based on age. Disability was 28 days for laparotomy, 7 days for laparoscopy, and 4 days for MTX treatment. The cost analysis compared two management policies: (1) Surgical management, exam under anesthesia, culdocentesis, dilation and curettage (D and C), and/or laparoscopy, and then salpingostomy or salpingectomy via laparotomy; or (2) medical management for patients eligible for MTX treatment and appropriate surgical treatment. Costs for failure of MTX included the cost of MTX treatment, the average total direct cost for laparotomy in patients not eligible for MTX, and a total of 28 days of disability. Potential annual national cost savings from MTX treatment were then extrapolated using national statistics on the incidence of EP. Fifty EP's were treated with an average direct cost of \$7,972 per case. Direct and indirect costs totaled \$662,180; direct costs were \$525,464 and indirect costs were \$136,716 (lost wages \$93,553, lost value of household management, \$43,163). The cost of MTX treatment in 1992 was \$1,495 per case based on the protocol for a single-dose MTX including emergency room visit, endovaginal ultrasound (US), D and C, before and after treatment blood tests, MTX, and followup visits. Direct and indirect costs for MTX treatment for those who were eligible totaled \$488,720; direct costs were \$387,160 and indirect costs were \$101,560. With one MTX treatment failure (93 percent success rate), the direct costs would total \$397,561 and indirect costs \$103,904 for a total of \$501,465. MTX treatment had a cost savings of 24 percent compared with surgical management. Fifteen (30 percent) of the cases

would have been eligible for MTX treatment with a total cost savings of greater than \$160,000. The potential annual national cost savings would be in excess of \$282 million given a 95 percent success rate and over \$265 million with a 90 percent success rate. Results indicate that MTX will not only reduce morbidity but also the substantial cost of treating ectopic pregnancy.

330

Impact of Public-Sector Expenditures for Contraceptive Services in California.

Form: Journal article.

Author: Forrest, J.D.; Singh, S.

Source: *Family Planning Perspectives*.
22(4):161-168, July-August 1990.

Abstract: For a state-level analysis in California, researchers adapted a methodology previously used to calculate the number of unintended pregnancies averted nationally through publicly funded contraceptive services. The approach involved (1) identifying contraceptive users who rely on publicly supported services, (2) calculating the number of unintended pregnancies and their outcomes, (3) estimating public sector costs, and (4) estimating public sector savings. Of the 526,300 women who obtained reversible contraceptives through publicly funded providers in California in fiscal year (FY) 1989, 87.5 percent relied on family planning clinics and 12.5 percent received care from private physicians reimbursed by MediCal. Researchers estimated that 136,800 unintended pregnancies, which would result in approximately 36,000 births, 85,100 abortions and 15,700 miscarriages, were averted each year because publicly funded contraceptive care was available from clinics and private physicians in California. Federal and state expenditures of \$46 million for contraceptive services in California in FY 1989 resulted in

an estimated savings of \$232-\$509 million (averaging \$353 million) in public costs for abortions, prenatal and maternity care, and welfare and supplementary nutritional programs during the first 2 years after a birth. These savings represent an average of \$7.70 saved for each dollar spent to provide contraceptive services. If none of the women used contraceptives, an additional \$925 million in public expenditures would be needed for women who would become pregnant, equivalent to \$20.10 for each dollar spent in FY 1989 for family planning services. The above savings/cost ratio is 75 percent higher than that previously estimated for the United States as a whole. 4 tables, 10 references.

331

Public-Sector Savings Resulting From Expenditures for Contraceptive Services.

Form: Journal article.

Author: Forrest, J.D.; Singh, S.

Source: *Family Planning Perspectives*.
22(1):6-15, January-February 1990.

Abstract: Almost one in four United States women who use a reversible method of contraception rely on a publicly funded source of care, either a family planning clinic or a private physician reimbursed by Medicaid. The approach used by researchers to analyze savings from public sector contraceptive services involved (1) identifying contraceptive users who rely on publicly supported services; (2) calculating the number of births, abortions, and miscarriages; (3) estimating public sector costs; and (4) estimating public sector savings. In 1982, 4.1 million women using reversible birth control methods relied on a family planning clinic. According to three scenarios of alternative contraceptive use patterns, if publicly funded services were not available, these women would have between 1.2 million and 2.1 million unintended pregnancies a year,

substantially more than the current level of approximately 400,000 per year. If these women relying on publicly funded services used no method of contraception at all, they would be expected to have more than 3.5 million unintended pregnancies in 1 year. In fiscal year (FY) 1987, federal and state governments spent \$412 million on contraceptive services for women who otherwise might not have been able to obtain them. If these services had not been available, the additional public costs for medical care, welfare, and supplementary nutritional programs during the first 2 years after a birth or for publicly funded abortions would have totaled \$1.2-\$2.6 billion. These savings represent an average of \$4.40 saved for every dollar of public funds spent to provide contraceptive services. Researchers estimated savings from availability of public sector family planning services in FY 1982 to be between \$0.6 billion and \$2.5 billion. 7 tables, 52 references.

332

Cost Effectiveness of an Accurate and Rapid Assay for Serum Human Chorionic Gonadotropin in Suspected Ectopic Pregnancy.

Form: Journal article.

Author: Gennis, P.; Gallagher, E.J.; Andersen, F.; Hain, L.

Source: *American Journal of Emergency Medicine.* 6(1):4-6, January 1988.

Abstract: Researchers at the Adult Emergency Department and the Women's Health Center of the Bronx Municipal Hospital (New York) studied the cost effectiveness and clinical utility of a simple, rapid, and accurate pregnancy test in the evaluation of suspected ectopic gestation. All women of childbearing age presenting to either clinical site between the hours of 9 a.m. and midnight during July

and August 1985 (237) were screened for study eligibility. Entry criteria were a chief complaint of lower abdominal pain and a serum human chorionic gonadotropin (hCG) level determination requested by the examining physician. During the first month of the study, the usual hCG test (Hybritech Tandem-E qualitative serum assay) was performed by the hospital laboratory on a routine basis. During the study's second month, two blood samples were taken from each patient. One was sent to the hospital laboratory for the routine hCG test and one (the Tandem Icon hCG qualitative serum assay) was performed by trained medical students at the bedside. The medical students were able to report a result to the examining physician in 15 minutes. Daily comparisons of the qualitative and quantitative hCG determinations were made. Followup information was obtained for all patients with detectable levels of hCG. The disposition and final diagnosis were obtained in each case by chart review or direct phone contact with the patient. Compared with the usual quantitative serum assay, the bedside performance of the Tandem Icon qualitative serum assay procedure was associated with a significant decrease in culdocenteses (7 versus 22), pelvic ultrasound examinations (13 versus 20), and hospital admissions (15 versus 24), with a net projected institutional reduction in health care costs of approximately \$123,000 annually. Specific cost figures for the net costs for the usual quantitative serum assay, were not mentioned in the source document. The reduction in procedures and admissions occurred primarily in nonpregnant women. 3 tables, 7 references.

333

Accessibility of Abortion Services in the United States.

Form: Journal article.

Author: Henshaw, S.K.

Source: *Family Planning Perspectives*.
23(6):246-252, 263,
November-December 1991.

Abstract: The author discusses abortion services' accessibility and related issues. Abortion services are provided in hospitals, doctors' offices and various types of clinics, but about two-thirds of procedures are performed in specialized abortion clinics. While this system appears to work well for most women, some women seeking abortion face obstacles related to distance, cost, harassment and special medical conditions. Nine percent of nonhospital abortion patients must travel more than 100 miles and 18 percent travel 50 to 100 miles for services. The average woman having a first-trimester nonhospital abortion paid \$251 in 1989. Fees were higher in facilities with small abortion caseloads. An abortion at 10 gestational weeks in a hospital cost an average of \$1,757. Charges for abortions at 16 weeks averaged \$509 in abortion clinics, compared with \$1,539 in hospitals for curettage and \$2,246 for instillation procedures. Only 43 percent of all abortion facilities offer services past 12 weeks, and 27-37 percent of nonhospital facilities say they do not treat patients who test positive for the human immunodeficiency virus (HIV), the virus that causes AIDS. Women who need special services such as an administration of Rh immunoglobulin, general anesthesia or HIV testing usually pay extra for these services. In addition, 85 percent of nonhospital facilities that serve 400 or more abortion patients a year reported some form of antiabortion harassment in 1988, most commonly picketing; there was virtually no

change in this proportion between 1985 and 1988. 5 tables, 1 figure, 30 references.

334

Cost-Benefit Analysis of Selective Screening Criteria for Chlamydia Trachomatis Infection in Women Attending Colorado Family Planning Clinics.

Form: Journal article.

Author: Humphreys, J.T.; Henneberry, J.F.; Rickard, R.S.; Beebe, J.L.

Source: *Sexually Transmitted Diseases*.
19(1):47-53, January-February 1992.

Abstract: Health care personnel screened women attending family planning clinics in Colorado during 1988 for Chlamydia trachomatis infection, using enzyme immunoassay (EIA). Researchers analyzed cervical specimens from 11,793 women attending 22 family planning clinics, and used patient history and physical examinations to assess risk factors for infection. A total of 913 patients (7.7 percent) had positive culture results for Chlamydia trachomatis. Multivariate analysis showed that infection was significantly related to endocervical bleeding, cervical mucopurulent discharge, a new sexual partner in the last 3 months or multiple previous sexual partners (greater than 3) in the last year, pregnancy, the use of oral contraceptives, and age. Researchers observed increased odd ratios for the combination of endocervical bleeding and mucopurulent discharge and sexual history that included partners over the previous year as well as the most recent 3 months. Health care workers used a combination of these criteria to selectively screen women attending Colorado family planning clinics on an ongoing basis. Researchers conducted a cost-benefit analysis employing a model used by Trachtenberg et al. They conducted a telephone survey of three Colorado hospitals to determine the average

costs attributable to conditions of untreated Chlamydia trachomatis infections, including outpatient treatment for pelvic inflammatory disease and inpatient treatment such as surgery. Cost of the test was \$5.50; cost of treatment was \$16 per treated client. Adoption of criteria with the greatest predictive value to detect Chlamydia trachomatis infection resulted in annual expenses of \$82,500 for selective screening and estimated total health care expenses of \$1,220,000. Universal screening would cost \$203,500, with an associated total health care cost of \$607,000. Researchers estimated total health care costs in the absence of screening at \$1,370,000. Analysis showed a significant financial benefit associated with universal screening over either selective screening or no screening for Chlamydia trachomatis in this population. 4 tables, 27 references.

335

Costs of Family Planning Services: A Critique of the Literature.

Form: Journal article.

Author: Janowitz, B.; Bratt, J.H.

Source: *International Family Planning Perspectives*. 18(4):137-144, December 1992.

Abstract: Researchers reviewed studies that estimate the costs of family planning methods, examined problems that arise in comparing cost estimates from different studies, and discussed steps that could lead to greater comparability of cost information. To examine the variation in costs, the authors compiled a summary of costs per couple-year of contraceptive protection for studies carried out in 13 countries and converted cost estimates to 1988 U.S. dollars. All output measures were converted to couple-years of protection. Sterilization costs ranged from \$2.50 to \$8.90 per couple-year; intrauterine device (IUD) costs ranged from \$4.68 to

\$19.11; and one couple-year of oral contraceptives ranged from \$6.05 to \$25.54. For community-based distribution (CBD) and social marketing programs, program costs were prorated among methods, and per-unit costs were multiplied by the number of units needed to yield one couple-year of protection. Costs for one couple-year of oral contraceptives ranged from \$4.70 to \$29.30; condom costs ranged from \$6.60 to \$50.53 per couple-year. Researchers defined costs by opportunity cost, market price of the inputs, and quantity. However, the researchers felt that the lack of a standard approach or format for gathering cost data was an obstacle to cost comparability. Six types of methodological issues contribute to the difficulty of comparing estimates: (1) Exclusion of some costs, such as indirect costs, from estimates; (2) varying methodologies for allocating time and overhead; (3) inconsistent treatment of capital costs; (4) classification of training as a capital or a recurrent cost; (5) treatment of free components; and (6) difference in exchange rates and comparative value of resources in different countries. All programs produced two basic types of results: (1) Contraceptive services to protect the user against unintended pregnancy, and (2) demand creation for family planning or for particular methods or brands. Differences in program output also undermine the comparability of cost estimates including (1) multiservice versus single-purpose programs, (2) services provided by other organizations, (3) program maturity and level of demand, and (4) content of service delivery programs. The cost of one program's output may contrast due to differences in program settings including (1) level of demand and program capacity, and (2) level of demand and competing services. Steps to increase comparability of costs estimates include (1) a standard costing approach to be developed and adopted by donors and programs, (2) program characteristics that are clearly understood, (3) comparisons of cost per couple-year of

protection should be considered invalid due to disparate cost calculations that vary with each program, and (4) special studies should be conducted where reliable cost estimates do not exist. 5 tables, 24 references.

336

Distribution of Contraceptives in Factories in St. Lucia.

Form: Journal article.

Author: Landry, E.G.; Louisy, R.; George, A.

Source: *Journal of Health Administration Education.* 5(1):105-117, Winter 1987.

Abstract: Researchers began a program in 1982 in 24 factories in St. Lucia, the Virgin Islands, to test two alternative systems for delivering family planning services. Research objectives included testing the knowledge and use of contraceptives among the female employees and evaluating the cost-effectiveness of the two different systems. Treatment Group A received services from a trained nurse who visited factories in this group twice a month. The nurse performed routine gynecological examinations, provided counseling about the use and side effects of the available contraceptives (the pill, condoms, and foam), sold contraceptives to participants, and held periodic group meetings to discuss family planning topics. Treatment Group B received services from a trained employee who answered basic questions about available contraceptives, sold them to participants, and referred clients to the project nurse or a local family planning clinic. Preintervention and postintervention surveys were conducted for both groups (190 and 267 for A and B, preintervention; 228 and 319, respectively, postintervention). Mean age was similar for both treatments and on both surveys (25-26 years). Researchers measured program achievement by couple-months of protection

(CMP) provided to each treatment group. They conducted a cost-effectiveness analysis (CEA) to measure the cost of replicating the project on a local level and to compare the cost of the two systems. In a 3-year period, the cost per CMP by treatment group ranged from \$10.10 to \$13.57 in Group A and from \$5.39 to \$10.32 in Group B. The study demonstrated an increase in contraceptive prevalence as a result of bringing family planning services to the workplace within Group B. Contraceptive prevalence in Group A factories slightly decreased. The overall cost per CMP was \$11.37 in the first year to \$6.10 in the second year. The cost per CMP was \$11.11 for Group A and \$6.91 for Group B. The program was acceptable and cost-effective. The St. Lucia Family Planning Association has adopted the Group B activities as a part of its community-based services. 1 figure, 7 tables, 4 references.

337

Benefit-Cost Analysis of Family Planning Services in Iowa.

Form: Journal article.

Author: Levey, L.M.; Nyman, J.A.; Haugaard, J.

Source: *Evaluation and the Health Professions.* 11(4):403-424, December 1988.

Abstract: Researchers conducted an analysis of publicly funded family planning services in Iowa to provide tangible estimates based on local data of the value of these services in averting unplanned and unwanted births to women who voluntarily use them. The study reports methods that can be applied by other states to evaluate their own family planning programs. Researchers measured benefits as the cost savings in public expenditures avoided by providing family planning services to low-income and marginal-income women. Researchers used Iowa data for Aid to

Families with Dependent Children (AFDC), food stamps, and Medicaid payments to calculate benefits. They adjusted total benefit savings to reflect the impact of family planning services on preventing births. The adjusted savings were accrued over 1-year and 5-year time frames and for four age groups (14-19, 20-29, 30-34, and 35-44). In the base year, the cost of providing family planning services in Iowa to the more than 56,000 women who used them was \$3.1 million, or \$59 per user. Results showed that the benefits of family planning services were highest for teenagers who would become eligible for public assistance programs upon the birth of a child. For persons already receiving government aid, benefits are greater than costs for 14-19-year-olds and 20-25-year-olds, and decline over the four age groups. Five-year projections showed that costs averted for teenagers are greater by a multiple of 6.6 over their 1-year savings compared to a multiple of about 3.3 in the other age groups. Benefits of family planning in Iowa generally outweighed the costs, except in the short term for women over age 29. Overall, the Iowa study showed a first-year savings of \$2.50 for every dollar spent in 1983 for family planning services. 7 tables, 9 references.

338

Economic Analysis of the Demand for Abortions.

Form: Journal article.

Author: Medoff, M.H.

Source: *Economic Inquiry*. 26(1):353-359, January 1988.

Abstract: A researcher conducted an analysis to evaluate economic aspects of the demand for abortions. The author (1) empirically estimates the demand for abortions using the economic model of fertility control developed by Michael (1973), (2) outlines Michael's

model in terms of the general theory of fertility control, and (3) discusses policy implications. Michael's model suggests that a couple's fertility control decisions are based on a comparison of the costs and benefits associated with each additional child over time. The Michael's abortion demand equation, a linear specification, estimates the abortion rate per thousand pregnancies in women aged 15-44 as the dependent variable and relates this variable to (1) the average price of abortions, (2) women's average income, (3) marital status and percentage of women who are unmarried, (4) employment status and labor force participation rate, (5) percentage of Roman Catholics in each state, (6) a dummy variable to control for differential tastes, and (7) a dummy variable to control for Medicaid funding. Since the price of abortions is determined simultaneously with the abortion rate, the equation was estimated using a 2-stage least squares regression. Results showed that the fundamental law of demand holds for abortions at a 0.05 level of significance for price and at a 0.01 level of significance for income. The price elasticity of demand of -0.81, which is inelastic, was consistent with the elasticities of other health services. The positive elasticity with respect to income was 0.79, which shows that abortion is a normal good. The demand for abortions was positively related to the labor force participation of women and to being unmarried. Catholic religion, education, and the poverty status of women were not statistically significant to the demand for abortions. 13 references.

339

Elective Hysterectomy: Benefits, Risks, and Costs.**Form:** Journal article.**Author:** Sandberg, S.I.; Barnes, B.A.; Weinstein, M.C.; Braun, P.**Source:** *Medical Care*. 23(9):1067-1081, September 1985.

Abstract: Researchers evaluated the effect of hysterectomy alone or hysterectomy and bilateral salpingo-oophorectomy (hysterectomy and oophorectomy) versus alternative medical management on life expectancy, quality of life, and direct medical costs. They approximated dollar costs of medical care by charges, adjusted to 1983 dollars according to the medical component of the Consumer Price Index. Using techniques of decision analysis and available data on sequelae, researchers found that gains in life expectancy and quality of life can be expected when women aged 30-60 undergo hysterectomy for a benign neoplasm, disorders of menstruation, acquired abnormal anatomy, cervical disease, or endometriosis, owing primarily to prevention of reproductive tract cancers, which outweighs the impact of operative mortality. However, women who have relatively high operative risk or low expected cancer risks beyond thresholds estimated in sensitivity analyses suffer losses in life expectancy. Women under age 35 not treated with replacement estrogens following hysterectomy and oophorectomy can expect net losses in life expectancy with surgical intervention due to increased risks of heart disease and osteoporosis. The net discounted costs of hysterectomy alone and hysterectomy with oophorectomy range from about \$1,200 to \$3,800 under the different combinations of age and indication examined. Cost effectiveness ranged from about \$7,900 per additional quality-adjusted life year for the youngest women with acquired abnormal anatomy to \$43,000 in the oldest women

undergoing hysterectomy for benign cervical disease. For women in the reproductive years who wish to preserve their potential to bear children, sterilization may be an unacceptable consequence of elective hysterectomy in the quality of life. 1 figure, 4 tables, 45 references.

340

Economic Evaluation of Transcervical Endometrial Resection Versus Abdominal Hysterectomy for the Treatment of Menorrhagia.**Form:** Journal article.**Author:** Sculpher, M.J.; Bryan, S.; Dwyer, N.; Hutton, J.; Stirrat, G.M.**Source:** *British Journal of Obstetrics and Gynaecology*. 100(3):244-252, March 1993.

Abstract: Researchers evaluated the relative health service cost of transcervical endometrial resection versus abdominal hysterectomy for the treatment of menorrhagia and the value women attach to their health state before and after surgery. They used a randomized, controlled trial of 200 women requiring surgical treatment of menorrhagia between January 1990 and May 1991; after withdrawals, 97 women underwent hysterectomy and 99 underwent endometrial resection. Researchers used the EuroQol Group 1990 health questionnaire to determine the change in women's valuation of their health state 1 month prior to their operation, 2 weeks after, and a minimum of 4 months after surgery. The EuroQol used a visual analogue scale resembling a thermometer running from 0 to 100. Data included all health service resources, valued at 1991-1992 UK unit costs, used for treatment up to 4 months after the operation: (1) pre-operative, (2) operative, (3) post-operative, (4) in-patient hotel, (5) complications, (6) retreatment, and (7) general practice. Mean with standard deviation (SD)

and median costs in British pounds per case for endometrial resection were pre-operative 15.69 (23.25), 10.95; operative 221.06 (27.92), 218.20; post-operative 2.62 (16.61), 0.12; in-patient hotel 236.38 (74.51), 226; complications 4.81 (26.64), 0.00; retreatment 80.47 (233.69), 0.00; general practice 3.82 (5.40), 0.00; and total costs 560.05 (261.22), 459.77. Mean with standard deviation (SD) and median costs in British pounds for hysterectomy were pre-operative 15.79 (23.48), 10.95; operative 275.47 (32.82), 266.98; post-operative 6.42 (20.46), 2.43; in-patient hotel 720.07 (114.79), 678; complications 28.41 (128.83), 0.00; retreatment (not applicable); general practice 11.16 (10.21), 10.40; and total costs 1,059.73 (198.04), 993.76. Total health service costs were significantly higher among abdominal hysterectomy patients (mean 1,059.73) than among endometrial resection patients (mean 560.05) with a mean difference of 499.68 British pounds (95 percent confidence interval, 432 to 567 British pounds). This significant difference existed under alternative assumptions about the difference in lengths of stay in hospital between the two treatment groups and the hotel cost per in-patient day. On a scale of 0 to 100, relative to a month before surgery, there was a statistically significant difference in favor of endometrial resection between the 2 groups in the increase in value women attach to their state at 2 weeks after surgery (mean difference 11.2; 95 percent confidence interval, 0.6-21.7) but not at a minimum of 4 months after surgery (mean difference 7; 95 percent confidence interval, -17.4 to 3.4). On the basis of health service resource cost up to 4 months after surgery, endometrial resection had a cost advantage over abdominal hysterectomy. However, given the fact that a subgroup of women required retreatment due to resection failure and that this study considered a relatively short period of followup, the authors suggested that the long term costs and benefits of endometrial

resection need to be evaluated before widespread diffusion is justified.

341

Routine Intravenous Pyelograms Before Hysterectomy in Cases of Benign Disease: Possibly Effective, Definitely Expensive.

Form: Journal article.

Author: Simel, D.L.; Matchar, D.B.; Piscitelli, J.T.

Source: *American Journal of Obstetrics and Gynecology*. 159(5):1049-1053, November 1988.

Abstract: Researchers examined whether preoperative intravenous pyelography (IVP) diminishes the risk of operative ureteral injury and its cost-effectiveness, and under what circumstances preoperative IVP is justifiable. They performed a cost-effectiveness study, based on decision analysis techniques using a tree-structured model to represent the choices, chances, and valued outcomes associated with the use of IVP before hysterectomy in cases of benign disease. The two choices were to obtain an IVP or not to obtain an IVP. The chances in the model were quantified as probabilities: (1) The risk of having a fatal complication (1 in 75,000), (2) the risk of operative ureteral injury among patients without IVP (injury or no injury), and (3) the risk of a ureteral injury with IVP (injury or no injury). In the group with IVP, the risk of operative ureteral injury was diminished by the test efficacy of the pyelogram. Outcomes were valued in terms of both cost and overall effectiveness. Overall effectiveness was based not only on test efficacy but also on probability of ureteral injury without the test and the probability of a fatal complication from the test. Estimates of risk and test efficacy were obtained from the literature or from opinions provided by practicing gynecologists and used to calculate the

marginal cost-effectiveness ratio. Sensitivity analyses were performed to examine the impact that changes in the estimates may have on the marginal cost-effectiveness ratio. The preoperative test efficacy was estimated at 25 percent and sensitivity analyses were performed over a broad range of test efficacy. At a baseline ureteral incidence injury rate of 0.5 percent (with a range of 0.1 to 2.5 percent), the marginal cost-effectiveness ratio indicates 833 pyelograms would be obtained to prevent a single injury and approximately \$3.33 million would be spent to prevent a single death. Estimating a real dollar charge of \$200 per intravenous pyelogram charged to the patient suggested that \$166,600 will be spent avoiding a single ureteral injury. As the probability of an injury increases, the marginal cost-effectiveness ratio was less dependent on the test efficacy and was more modest. Sensitivity analyses indicated that the marginal cost-effectiveness ratio varies from 4,225 pyelograms to prevent one injury when the risk is low to 402 pyelograms when the risk of injury is high. Since abnormal ureteral anatomy probably predicts ureteral injury, the authors suggested selectively obtaining preoperative pyelograms only when the probability of an abnormality is high.

342

Public Benefits and Costs of Government Funding for Abortion.

Form: Journal article.

Author: Torres, A.; Donovan, P.; Dittes, N.; Forrest, J.D.

Source: *Family Planning Perspectives*.
18(3):111-118, May-June 1986.

Abstract: In state referenda to end public funding of abortions for low-income women, one of the most successful tactics of abortion foes has been to charge that abortion funding increases the burden on taxpayers. A state-by-

state analysis by The Alan Guttmacher Institute (AGI) shows that the opposite is true. For every tax dollar spent to pay for abortions for low-income women, about \$4 is saved in public medical and welfare expenditures. The savings are in public expenditures that otherwise would have to be incurred because of the babies that these women would have borne. On the basis of earlier research, it was assumed that 20 percent of Medicaid-eligible women who could not obtain abortions would give birth. Public costs examined in the AGI analysis include Medicaid expenditures for prenatal care, delivery, and postnatal care for the mother, and for newborn care, neonatal intensive care, and pediatric care for the child for the first 2 years of life; as well as expenditures for Aid to Families with Dependent Children (AFDC), food stamps, and the Special Supplemental Food Program for Women, Infants and Children (WIC) during those first 2 years. With no restrictions on public funding of abortions, the net savings in medical and social welfare costs would amount to \$340-\$415 million over the following 2 years. The net saving in the Medicaid program would be at least \$194 million and in the social welfare programs, at least \$146 million. The benefit-to-cost ratio varies from about 9:1 in Massachusetts to 2:1 in Hawaii and Pennsylvania. Public funding of abortion saves money and helps ensure that low-income women have control over their childbearing. 3 tables, 33 references.

343

Cost-Based Decision Analysis for Chlamydia Screening in California Family Planning Clinics.

Form: Journal article.

Author: Trachtenberg, A.I.; Washington, A.E.; Halldorson, S.
Source: *Obstetrics and Gynecology*. 71(1):101-108, January 1988.

Abstract: Antibody-based methods to diagnose Chlamydia trachomatis infection of the cervix have recently made population screening programs possible for this frequently asymptomatic and epidemic problem. Researchers constructed a decision model, using medical care costs as utilities, to determine the total costs of screening versus not screening in California state-funded family planning clinics, and to determine the prevalence of infection at which screening could be expected to pay for itself. The test used for Chlamydia screening would be a direct-smear fluorescein-labeled antibody test (MicroTrak) that would cost \$6.75 per test (cost quoted to the Office of Family Planning), with specificity of 98 percent and sensitivity of 90 percent. Approximately 400,000 women per year are served by the California Office of Family Planning. Cost of treatment for a positive test was estimated at \$16 per patient and \$20 for each partner. Analysis showed that the screening program would eradicate 33,516 Chlamydial infections each year in 400,000 women with a Chlamydia prevalence of 9.8 percent. This would produce a net savings of \$6 million in the first year, with annual savings eventually increasing to over \$13 million, from the prevention of Chlamydia-associated pelvic inflammatory disease and other long-term sequelae such as tubal infertility and ectopic pregnancy. A total of \$63.8 million (in 1986 dollars) could be saved in the first 5 years of such a statewide screening program. In populations with

infection prevalence of 2 percent or more, such screening will pay for itself and can be considered cost effective. Screening of asymptomatic women for Chlamydia should be carried out in most American family planning clinics. 3 figures, 4 tables, 39 references.

344

Ectopic Pregnancy in the United States: Economic Consequences and Payment Source Trends.

Form: Journal article.

Author: Washington, A.E.; Katz, P.
Source: *Obstetrics and Gynecology*. 81(2):287-292, February 1993.

Abstract: Researchers conducted a study to (1) estimate the annual direct and indirect costs of ectopic pregnancy in the United States and (2) examine trends in payment source. To estimate direct medical care costs and to determine payment sources, investigators analyzed hospital discharge data, including hospital bills, for 1982-1989 from a San Francisco hospital, and California statewide hospital discharge data for 1983-1987. Researchers examined national labor data to compute indirect cost. Analysis showed that the total cost of ectopic pregnancy in 1990 was estimated at nearly \$1.1 billion, of which direct costs of hospitalization and other medical treatment contributed 77 percent. Average hospital costs were estimated at \$6,079 per person, hospitalization-related physician fees at \$3,254 per person, and average outpatient costs \$149, for a total direct cost per person of \$9,482. Of the total indirect costs (\$250.5 million), 67 percent was attributed to the value of lost wages and the remainder to the lost value of household management. Public payment sources covered the largest portion of ectopic pregnancy-related direct costs among women under age 19 (35 percent), but private insurance covered the

largest portion among women ages 20-29 (32 percent) and women over age 30 (43 percent). In general, the proportion of payments made by private insurance has decreased, while the proportion of payments made by public pay sources, health maintenance organizations, and preferred provider organizations has increased. Findings suggest that ectopic pregnancy results in a substantial economic burden, with an increasing share of direct costs being borne by public pay sources. Appropriate use of cost-effective management approaches can reduce costs, while preventive measures that decrease the risk of ectopic pregnancy can both save resources and spare human suffering. 2 figures, 4 tables, 14 references.

345

Gynecological Services Utilization by Contraceptive Clients: A Cost Analysis.

Form: Journal article.

Author: Zapka, J.G.; Averill, B.W.; Pastides, H.

Source: *Journal of American College Health.* 32(2):66-72, October 1983.

Abstract: Researchers conducted a cost-analysis of gynecologic service utilization in a prepaid university health plan in Massachusetts. They audited health records for 495 women who had used a diaphragm for contraception, and subsequently computed costs for contraception and pregnancy-related and other gynecological services. The cost analysis procedure consisted of five different methods: (1) The double-apportionment method of allocating costs to revenue-producing departments, (2) the compilation of service units, (3) the identification of the number of encounters for each specific diagnosis or procedure performed, (4) the separation of initial visits and followup visits for the same episode, and (5) the multiplication of the average cost per visit by

the average number of specified visits as identified in the study. Eighty-four percent of the study population were women aged 18-22 and 91 percent were white. There were 1,483 visits for gynecologic services for the total sample, including the subsample of college seniors (the class of 1981). Twenty-eight percent of the sample were seniors, 24 percent were juniors, 21 percent were sophomores, and 25 percent were freshmen. The average cost of contraception services per senior client was \$83.10; for pregnancy-related care and followup (including abortion), the average cost was \$47.43; for other gynecological visits, average costs were \$100.51. The cost of coded gynecologic services per patient for the 3.5-year period was \$293.43. The study demonstrated that diagnostic group-focused analysis studies are feasible and accurate when (1) a uniform reporting system is in place that captures units of time spent, reports by clinician type, and also by initial and followup visits; (2) all assignments to diagnostic, procedure, or symptom group are done in medical records to ensure uniform coding; and (3) the budgeting system permits cost center assignment. 6 tables, 20 references.



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References

R346

Ounce of Prevention: STDs and Women's Health.

Form: Journal article.

Author: Althaus, F.A.

Source: *Family Planning Perspectives*.

23(4):173-177, July-August 1991.

R347

Induction of Ovulation: Cost-effectiveness and Future Prospects.

Form: Journal article.

Author: Baird, D.T.; Ledger, W.L.;

Glasier, A.F.

Source: *Bailliere's Clinical Obstetrics and*

Gynaecology. 4(3):639-650, September 1990.

R348

Prospective Comparison of Videopelviscopy With Laparotomy for Ectopic Pregnancy.

Form: Journal article.

Author: Baumann, R.; Magos, A.L.;

Turnbull, A.

Source: *British Journal of Obstetrics and*

Gynaecology. 98(8):765-771, August 1991.

R349

Laparoscopically Assisted Vaginal Hysterectomy in a University Hospital: Report of 82 Cases and Comparison With Abdominal and Vaginal Hysterectomy.

Form: Journal article.

Author: Boike, G.M.; Elfstrand, E.P.;
DePriore, G.; Schumock, D.; Holley, H.S.;
Lurain, J.R.

Source: *American Journal of Obstetrics and Gynecology*. 168(6, Part 1):1690-1697,

June 1993.

R350

Cost Analysis of a Mucoadhesive Foam Versus Conventional Treatment for Postepisiotomy Patients.

Form: Journal article.

Author: Bouis, P.; Hoffman, M.;
Newton, W.; Johnson, S.; Mack, M.

Source: *Hospital Formulary*.

21(12):1226-1228, December 1986.

R351

Cost Effectiveness of Testing for Chlamydial Infections in Asymptomatic Women.

Form: Journal article.

Author: Buhaug, H.; Skjeldestad, F.E.;
Backe, B.; Dalen, A.

Source: *Medical Care*. 27(8):833-841,

August 1989.

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R352

Operative Laparoscopy in the Management of Tubal Ectopic Pregnancy.

Form: Journal article.

Author: Chatwani, A.; Yazigi, R.; Amin-Hanjani, S.

Source: *Journal of Laparoendoscopic Surgery.* 2(6):319-324, December 1992.

R353

Cost-benefit Analysis of Cephadrine and Mezlocillin Prophylaxis for Abdominal and Vaginal Hysterectomy.

Form: Journal article.

Author: Davey, P.G.; Duncan, I.D.; Edward, D.; Scott, A.C.

Source: *British Journal of Obstetrics and Gynaecology.* 95(11):1170-1177, November 1988.

R354

Comparative Study of Operative Laparoscopy Versus Laparotomy: Analysis of the Financial Impact.

Form: Journal article.

Author: Davison, J.M.; Park, W.; Penney, L.L.

Source: *Journal of Reproductive Medicine.* 38(5):357-360, May 1993.

R355

Hormone Replacement Therapy: Risks, Benefits, and Costs.

Form: Journal article.

Author: Delva, M.D.

Source: *Canadian Family Physician.* 39:2149-2154, October 1993.

R356

Family Planning Clinics: Facing Higher Costs and Sicker Patients.

Form: Journal article.

Author: Donovan, P.

Source: *Family Planning Perspectives.* 23(5):198-203, September-October 1991.

R357

Patient Cost in the Treatment of Postsurgical Female Pelvic Infection.

Form: Journal article.

Author: Faro, S.

Source: *American Journal of Medicine.* 78(Supplement 6B):165-169, June 28, 1985.

R358

Cost-Effectiveness of Strategies to Evaluate Postmenopausal Bleeding.

Form: Journal article.

Author: Feldman, S.; Berkowitz, R.S.; Tosteson, A.

Source: *Obstetrics and Gynecology.* 81(6):968-975, June 1993.

R359

Cost-effectiveness of Cefonicid Versus Cefoxitin Prophylaxis for Cesarean Section (Editorial).

Form: Journal article.

Author: Glazier, H.S.

Source: *Clinical Pharmacy.* 6(12):923-924, December 1987.

R360

Public Funding of Contraceptive, Sterilization and Abortion Services, Fiscal Year 1990.

Form: Journal article.

Author: Gold, R.B.; Daley, D.

Source: *Family Planning Perspectives*. 23(5):204-211, September-October 1991.

R361

Predictions of the Effectiveness of a Policy of Screening for Chlamydia Trachomatis in Women Requesting Termination of Pregnancy.

Form: Journal article.

Author: Griffiths, M.

Source: *British Journal of Family Planning*. 17(2):44-45, July 1991.

R362

Single-dose Cephalosporin for Prevention of Major Pelvic Infection After Vaginal Hysterectomy: Cefazolin Versus Cefoxitin Versus Cefotaxime.

Form: Journal article.

Author: Hemsell, D.L.; Bawdon, R.E.; Hemsell, P.G.; Nobles, B.J.; Johnson, E.R.; Heard, M.C.

Source: *American Journal of Obstetrics and Gynecology*. 156(5):1201-1205, May 1987.

R363

Medicaid Cutoff and Abortion Services for the Poor.

Form: Journal article.

Author: Henshaw, S.K.; Wallisch, L.S.

Source: *Family Planning Perspectives*. 16(4):170-180, July-August 1984.

R364

Assisted Conception: Health Services and Evaluation.

Form: Journal article.

Author: Lancaster, P.

Source: *International Journal of Technology Assessment in Health Care*. 7(4):485-499, Fall 1991.

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Critical Analysis of 75 Therapeutic Abortions.

Form: Journal article.

Author: Leschot, N.J.; Verjaal, M.; Treffers, P.E.

Source: *Early Human Development*. 10(3):287-293, January 1985.

R366

Medical Radiodiagnosis and Pregnancy: Evaluation of Options When Pregnancy Status is Uncertain.

Form: Journal article.

Author: Mossman, K.L.

Source: *Health Physics*. 48(3):297-301, March 1985.

R367

Public Funding of Contraceptive, Sterilization and Abortion Services, 1982.

Form: Journal article.

Author: Nestor, B.; Gold, R.B.

Source: *Family Planning Perspectives*. 16(3):128-133, May-June 1984.

R368

Evaluation of the Effect of Contraceptive Prices on Demand in Eight Western European Countries.

Form: Journal article.

Author: Oddens, B.J.

Source: *Advances in Contraception*.
9(1):1-11, March 1993.

R369

Partner Notification for Control of HIV: Results After 2 Years of a Statewide Program in Utah.

Form: Journal article.

Author: Pavia, A.T.; Benyo, M.; Niler, L.; Risk, I.

Source: *American Journal of Public Health*.
83(10):1418-1424, October 1993.

R370

Healthier Mothers and Children Through Family Planning.

Form: Journal article.

Author: Rinehart, W.; Kols, A.; Moore, S.H.

Source: *Population Reports, Series J: Family Planning Programs*. (27):657-696, May-June 1984.

R371

Benefit-Cost Analysis of Antimicrobial Prophylaxis in Abdominal and Vaginal Hysterectomy.

Form: Journal article.

Author: Shapiro, M.; Schoenbaum, S.C.; Tager, I.B.; Munoz, A.; Polk, B.F.

Source: *Journal of the American Medical Association*. 249(10):1290-1294, March 11, 1983.

R372

Induced Abortion: Chlamydia Trachomatis and Postabortal Complications: A Cost Benefit Analysis.

Form: Journal article.

Author: Skjeldestad, F.E.; Tuveng, J.; Solberg, A.G.; Molne, K.; Dalen, A.; Buhaug, H.

Source: *Acta Obstetricia et Gynecologica Scandinavica*. 67(6):525-529, 1988.

R373

Patient Costs for Prophylaxis and Treatment of Obstetric and Gynecologic Surgical Infections.

Form: Journal article.

Author: Stein, G.E.

Source: *American Journal of Obstetrics and Gynecology*. 164(5, Part 2):1377-1380, May 1991.

R374

Randomized Double-Blind Comparison of the Efficacies, Costs, and Vaginal Flora Alterations With Single-Dose Ceftriaxone and Multidose Cefazolin Prophylaxis in Vaginal Hysterectomy.

Form: Journal article.

Author: Stiver, H.G.; Binns, B.O.; Brunham, R.C.; Cheng, N.; Dean, D.M.; Goldring, A.M.; Walker, J.B.; Tan, E.; McLeod, J.

Source: *Antimicrobial Agents and Chemotherapy*. 34(6):1194-1197, June 1990.

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Results of Establishing Medical Guidelines for Selecting Oral Contraceptive Types in Family Planning Agencies.

Form: Journal article.

Author: Stumpf, P.G.

Source: *Contraception*. 29(6):511-517, June 1984.

R376

Cost-effectiveness of Gamete Intrafallopian Transfer in Comparison With Induction of Ovulation With Gonadotropins in the Treatment of Female Infertility: A Clinical Trial.

Form: Journal article.

Author: Wessels, P.H.; Cronje, H.S.; Oosthuizen, A.P.; Trampelmann, M.D.; Grobler, S.; Hamlett, D.K.

Source: *Fertility and Sterility*. 57(1):163-167, January 1992.

Nutrition

377

Prenatal WIC Participation Can Reduce Low Birth Weight and Newborn Medical Costs: A Cost-benefit Analysis of WIC Participation in North Carolina.

Form: Journal article.

Author: Buescher, P.A.; Larson, L.C.; Nelson, M.D.; Lenihan, A.J.

Source: *Journal of the American Dietetic Association.* 93(2):163-166, February 1993.

Abstract: Researchers assessed the impact of prenatal participation in the Special Supplemental Food Program for Women, Infants and Children (WIC) on low-birthweight and Medicaid costs for newborn medical care in North Carolina in 1988. They compared average costs for newborn medical care for the Medicaid recipients enrolled in WIC with those for the non-WIC mothers to assess the association of WIC participation and morbidity in early infancy. Researchers linked Medicaid and WIC data files to birth certificates for live births in North Carolina in 1988 to (1) identify Medicaid births; (2) identify women who received WIC services during the prenatal period; and (3) track all claims paid for any service to the infant (e.g., inpatient, outpatient, physician, medication) beginning within 60 days of age. Each WIC participant's identification number was matched to WIC redemption files to determine the date when WIC services began and the number and dollar value of food vouchers redeemed during the pregnancy. The WIC program cost was calculated as the total value of all food vouchers redeemed plus an administrative cost estimated to be \$8 per participant per month. Within the group of Medicaid births, researchers compared WIC-participants with non-WIC participants by assessing the association between prenatal WIC participation and low birthweight and by statistically

controlling the groups for differences in (1) age, (2) race, (3) marital status, (4) education, (5) previous adverse birth outcomes, (6) adequacy of prenatal care, (7) maternal smoking, (8) maternal medical risk factors, and (9) receipt of Medicaid case management services. The study excluded births with no prenatal care. Data analysis looked at whether low birthweight differed by level or degree of WIC participation. Results indicated that maternal participation in prenatal WIC programs in North Carolina improved rates of low birthweight and very low birthweight and reduced costs for newborn medical care. A higher level of participation in WIC related to better birth outcomes and lower costs for newborn medical care. 4 tables, 15 references.

378

Economic Costs of Nutrition Services for a Low-Income Prenatal Population: I. Direct Costs.

Form: Journal article.

Author: Disbrow, D.D.

Source: *Journal of Pediatric and Perinatal Nutrition.* 1(2):35-48, Fall-Winter 1987.

Abstract: Using an economic framework, researchers pilot tested methods of measuring the economic costs of nutrition counseling for an urban low-income prenatal population. The nutritional counseling activities, which included care from a nutritionist, nurse practitioner, public health nurse, social worker, and physician in one of the Alameda County, California, Department of Health Care Services Agencies, served as the source of the cost data. The study clinic provided prenatal services 3 days a week; the public health nutritionist was in the clinic on 2 of the 3 days. Clinic protocols called for nutrition

assessment and counseling for each patient at the initial prenatal visit, and at least once during each trimester. Additional nutrition counseling was available for those assessed to be at high risk. Nutrition services were always integrated with the other components of prenatal care. Costs for the prenatal women were assessed by a structured interview using a standardized questionnaire. The questionnaire was pretested at the clinic during January 1984 and revised. Data were collected 1 day a week for 24 weeks between February and December 1984. All clients receiving nutrition services during the observation days were asked to participate in the study; there were no criteria for exclusion. Direct costs identified were personnel, space, materials used for nutrition assessment and education, and the client's travel and child care costs. Personnel costs were measured through the observation and recording of the time the nutritionist spent in the various components of nutrition services. The value of this time was calculated by applying the minute rate of the mean salary package for counseling nutritionists in the county agency. In addition to the nutritionist, personnel rates were also calculated for the other health team members. The average cost of nutrition services per pregnant woman was \$40.87, or total direct costs were \$3,923.18 for the entire study group of pregnant women. The costs for the nutrition services were calculated separately from the initial prenatal visit and the followup visits; services were divided into chart review, assessment, counseling, referrals, charting, and case conferences. Estimated direct clinic costs of nutritional services for 96 women in the study group throughout pregnancy included \$1,062.72 for the nutritionist for initial prenatal visits, \$1,251.84 for followup prenatal visits, and \$760.56 for nutrition services delivered by non-nutrition health care providers. Space cost was calculated solely by square footage as \$36.10 per month, or \$4.51 per day; total space cost for nutrition services

was \$324.72. Other clinic direct costs for nutritional services for the study group included a sign language translator, \$27.00, and materials used for nutrition assessment and education, \$38.62. Direct costs for client transportation provided by the clinic were \$36.36. Client direct costs for the entire group included (1) other transportation costs not included in the clinic-provided transportation, \$345.24, and (2) child care costs, \$76.12. The methods developed to measure and value direct costs of prenatal nutrition services were successfully pilot tested. These methods can be used in future studies for evaluating cost benefit and cost effectiveness of nutrition services.

379

Economic Costs of Nutrition Services for a Low-Income Prenatal Population: II. Indirect and Intangible Costs.

Form: Journal article.

Author: Disbrow, D.D.

Source: *Journal of Pediatric and Perinatal Nutrition.* 2(1):17-26, 1988.

Abstract: Researchers conducted a pilot study to explore a method of determining the value of indirect costs for a low-income prenatal population to obtain nutrition services. They also considered intangible costs although these costs were not measured or valued.

Investigators collected indirect cost data by conducting structured interviews with pregnant women who received nutrition services at a county health department ambulatory care center. The interview requested information about the mode, cost, and time of travel to the clinic and the cost of child care for older children. The two primary intangible costs related to nutrition care during pregnancy were the anxiety women expressed over their appearance and weight during pregnancy, and their suffering from morning sickness.

Researchers used the minimum wage (\$3.35) to calculate the value of the clients' time unless the client had a job. They collected complete data for 96 of the 100 women who participated in the study. Mean indirect cost per person for an initial visit was \$7.85; for two followup visits, \$13.51. Total mean direct costs for the clinic for the group were \$34.99, and for the client, \$4.39; mean indirect costs were \$21.37. For a more realistic estimate, making the value of the clients' time \$5.47 (mean wage of those employed) and using \$8.53 for all the value of the clients' transporters' time, the indirect costs were \$3,220 (mean \$33.54), with a total economic cost of \$7,000 (mean \$72.92). 2 tables, 16 references.

380

Toward a Benefit-Cost Analysis of Anemia Reduction.

Form: Journal article.

Author: Levin, H.M.

Source: *American Behavioral Scientist.*

28(4):543-558, March-April 1985.

Abstract: A researcher reports on progress toward cost-benefit evaluations of potential interventions for reducing iron deficiency anemia in individuals in developing countries. Costs of anemia reduction derive from the dietary iron supplements and the system for delivering them and ensuring that they are consumed by appropriate populations.

Potential benefits include improved feelings of well-being, higher work output, reduced morbidity associated with iron deficiency, and more effective learning among students.

Provided are a brief summary on the prevalence and treatment of anemia; benefits of anemia reduction, with special emphasis on work output; and suggestions of the magnitude of costs and benefits of hypothetical interventions. For communities with a health

care delivery system in place, the costs might only be for providing nutritional supplements of iron in medicinal form or in dietary fortification. The cost for 100-180 mg of ferrous sulphate per day (in 1981) would be about \$1.50 or less per year. Even with marginal processing and distribution costs added, it would be about \$3 per year. Work output and productivity could increase from 30-75 percent. With wages of even \$1 a day (typical of developing societies), changes in work output would raise output by \$0.30 to \$0.75 a day, or the equivalent of \$90-\$225 a year. That is, for \$3 a year per person, it might be possible to get increases in output from \$90-\$225 a person. Preliminary estimates of costs of supplementation where a delivery system must be established range from about \$6-\$25 a year per person, depending on population density. Dietary fortifications of salt and sugar with iron have been estimated at only \$0.07-\$0.10 a year per person. The very large potential benefits relative to costs suggest that field trials and more refined analyses would show a promising cost-benefit result from a program of iron supplementation. 43 references.

381

Prenatal Participation in WIC Related to Medicaid Costs for Missouri Newborns: 1982 Update.

Form: Journal article.

Author: Schramm, W.F.

Source: *Public Health Reports.*

101(6):607-615, November-December 1986.

Abstract: To determine if Supplemental Food Program for Women, Infants and Children (WIC) prenatal participation is associated with a reduction in Medicaid costs within 30 days of birth, researchers replicated in 1982 a 1980 evaluation of prenatal participation in Missouri. Researchers used a file of 9,086

Missouri Medicaid records matched with the corresponding birth records. The 1980 study found that WIC participation related to a reduction in Medicaid newborn costs. Between 1980 and 1982, the Missouri WIC program expanded in number of counties, number of participating mothers, and proportion of Medicaid mothers on WIC. The Missouri Medicaid program also changed the hospital reimbursement procedures. The current study used a 1982 WIC-Medicaid file to verify the 1980 findings. The study involved linking five separate data files: (1) Medicaid, (2) birth certificates, (3) WIC records, (4) NICU admissions, and (5) death certificates. Data analysis confirmed the 1980 findings, with the 1982 results showing slightly improved pregnancy outcomes for WIC participants and slightly reduced benefit-to-cost ratios compared with the 1980 findings. In 1982, WIC participation related to an increase in mean birthweight of 31 grams and reductions in low birthweight rates and in neonatal death rates. WIC apparently reduced the incidence of low birthweight, respiratory distress syndrome, and neonatal mortality. Adjusted Medicaid paid claim amounts for newborns averaged \$76 less for WIC participants than for non-WIC clients, a statistically significant reduction. Mean Medicaid costs for WIC newborns were \$1,250 compared with \$1,326 for those newborns whose mothers were not on WIC. 6 tables, 8 references.

382

WIC Prenatal Participation and Its Relationship to Newborn Medicaid Costs in Missouri: A Cost/Benefit Analysis.

Form: Journal article.

Author: Schramm, W.F.

Source: *American Journal of Public Health.* 75(8):851-857, August 1985.

Abstract: Researchers in Missouri examined whether participation in the Special Supplemental Food Program for Women, Infants and Children (WIC) would relate to a reduction in Medicaid costs within 30 days after birth. To determine whether the reduction in Medicaid costs would be greater than the WIC costs for those women and whether WIC would increase birthweight and reduce low birthweight (LBW) among Medicaid births, researchers linked (1) Medicaid files, (2) birth certificates, (3) WIC records, and (4) neonatal intensive care unit (NICU) admissions. Researchers performed the evaluation of WIC using 7,628 Missouri Medicaid records matched with their corresponding 1980 birth records.

Researchers divided the file into a WIC group containing 1,883 records and a non-WIC comparison group of 5,745 records.

Demographic analysis revealed little difference between the two groups; however, the WIC group had a lower percentage of metropolitan births than the comparison group, which is important because metropolitan medical costs tend to be higher than nonmetropolitan medical costs. Statistical analysis indicated WIC participation related to a reduction in Medicaid newborn costs of about \$100 per participant. There was no effect on mothers' Medicaid costs. Reductions in LBW rates and NICU admission rates among WIC infants provided two possible reasons for the reduced Medicaid costs associated with WIC food supplementation. As WIC food costs increased, both mean birthweight and newborn

Medicaid savings also increased. Evidently mothers who drop out of WIC or who enter WIC late in pregnancy experience little or no benefits from WIC food supplementation. 8 tables, 10 references.

383

Prenatal Nutrition Services: A Cost Analysis.

Form: Journal article.

Author: Splett, P.L.; Caldwell, H.M.; Holey, E.S.; Alton, I.R.

Source: *Journal of the American Dietetic Association.* 87(2):204-208, February 1987.

Abstract: Researchers examined comprehensive prenatal nutrition services provided to low-income women in two urban settings in terms of total costs, per client costs, per visit costs, and cost per successful outcome, using standard cost-accounting principles. They studied outcome measures using standard procedures based on written quality assurance criteria. Data sources for cost analysis came from the organizations' financial management and reporting systems, statistical systems for recording services rendered, and evaluation system for outcome measures from quality assurance audits. The study population included 196 clients of a county hospital program and 357 in a city health department program. In these programs, nutrition services were delivered for a per client cost of \$72 in the health department setting and \$121 in the hospital-based prenatal care program. The total cost of nutrition services in this study for 1982 was \$25,610 through the health department and \$23,714 at the hospital. Further analysis illustrates that total and per client costs can be misleading and that costs related to successful outcomes are much higher. The three levels of cost analysis reported provide baseline data for quantifying the costs of providing prenatal

nutrition services to healthy pregnant women. Cost information from these cost analysis procedures can be used to guide adjustments in service delivery to assure successful outcomes of nutrition care. Accurate cost and outcome data are necessary prerequisites to cost-effectiveness and cost-benefit studies. 1 figure, 4 tables, 12 references.

384

Cholesterol-lowering Diets May Increase the Food Costs for Danish Children: A Cross-sectional Study of Food Costs for Danish Children With and Without Familial Hypercholesterolaemia.

Form: Journal article.

Author: Stender, S.; Skovby, F.; Haraldsdottir, J.; Andresen, G.R.; Michaelsen, K.F.; Nielsen, B.S.; Ygil, K.H.

Source: *European Journal of Clinical Nutrition.* 47(11):776-786, November 1993.

Abstract: Researchers compared food costs for children under dietary treatment for familial hypercholesterolemia with children without known familial hypercholesterolemia to evaluate Danish financial compensation programs for children in dietary treatment for familial hypercholesterolemia. The study included four sets of dietary data from 135 Danish children: 30 children in treatment for heterozygous familial hypercholesterolemia, one group of 25 and one group of 40 school children from Copenhagen, and 40 school children from Jutland. The daily intake of macronutrients and the daily cost of the diet for each child were calculated from dietary intakes and average prices of 365 different food items. The prices used in the food cost calculations, based on 1991 prices, came from the Danish Bureau of Statistics household budget survey and the prices collected in supermarkets by two dieticians. Researchers determined total costs by calculating the prices

per weight unit, with corrections made for food wastage during preparation and cooking. Multiple linear regression models determined the dependence of dietary cost per unit of energy on (1) grams of fiber per unit of energy, (2) percentage of energy from protein, (3) percentage of energy from fat, and (4) daily intake of energy. The mean and standard deviations (SD) of percentages of energy (E percent) from fat in the diet of children with and without known familial hypercholesterolemia were 23.6, 0.8 (SD) E percent and 34.5, 0.5 (SD) E percent, respectively. The dietary costs per unit of energy in these two groups were 3.79, 0.12 (SD) Danish crowns (DKr) and 3.34, 0.05 (SD) DKr. Costs of the various food groups expressed in DKr per 10 units of energy/percentage of the daily cost for the children with familial hypercholesterolemia and Danish school children from Copenhagen respectively, included: (1) Meat, 8.64/25 percent and 6.5/21 percent; (2) fruit, 4.47/13 percent and 1.82/6 percent; (3) milk products, 3.81/11 percent and 5.03/16 percent; (4) vegetables, 3.76/11 percent and 2.04/7 percent; (5) bread, 3.26/9 percent and 2.36/8 percent; (6) fish, 2.02/6 percent and 1.35/4 percent; (7) juice, 1.98/6 percent and 0.27/1 percent; (8) soft drinks, 1.59/5 percent and 0.63/2 percent; (9) cake, 0.29/1 percent and 1.15/4 percent; (10) candy, 0.15/0 percent and 2.09/7 percent; and (11) other, 4.51/13 percent and 7.81/25 percent. Total costs for the children with familial hypercholesterolemia and Danish school children from Copenhagen, respectively were 34.5 and 31.1 DKr per 10 units of energy. The cost per unit of energy increased with decreasing fat energy percentage of the diet for all children as one group (r equals -0.37), as well as for the group of children without familial hypercholesterolemia (r equals -0.35). Stepwise multiple regression analysis showed that the differences in cost per unit of energy between the groups could be explained by

differences in percentage of energy from fat. The authors conclude that a reduction of dietary fat from 35 percent to 25 percent may increase food costs by 10 to 20 percent for Danish children.

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References

R385

Standardized Versus Pharmacist-Monitored Individualized Parenteral Nutrition in Low-Birth-Weight Infants.

Form: Journal article.

Author: Dice, J.E.; Burckart, G.J.; Woo, J.T.; Helms, R.A.

Source: *American Journal of Hospital Pharmacy.* 38(10):1487-1489, October 1981.

R386

Cost Containment Using Cysteine HC1 Acidification to Increase Calcium/Phosphate Solubility in Hyperalimentation Solutions.

Form: Journal article.

Author: Schmidt, G.L.; Baumgartner, T.G.; Fischlschweiger, W.; Sitren, H.S.; Thakker, K.M.; Cerda, J.J.

Source: *Journal of Parenteral and Enteral Nutrition.* 10(2):203-207, March-April 1986.

R387

Summary Document of Nutrition Intervention in Prenatal Care.

Form: Journal article.

Author: Trouba, P.H.; Okereke, N.; Splett, P.L.

Source: *Journal of the American Dietetic Association.* 91(11, Supplement):S21-S26, November 1991.

388

Cost-effectiveness of the Matlab MCH-FP Project in Bangladesh.

Form: Journal article.

Author: Attanayake, N.; Fauveau, V.; Chakraborty, J.

Source: *Health Policy and Planning.*

8(4):327-338, November 1993.

Abstract: Researchers evaluate the cost-effectiveness of the Matlab Maternal and Child Health-Family Planning (MCH-FP) project in rural Bangladesh from 1986 to 1989 to assess its economic viability. Between 1986 and 1989, there were five new interventions: (1) Nutrition education and rehabilitation (NRU), (2) maternity care (MAT), (3) vitamin A capsule distribution (VAC), (4) control of acute respiratory infections (ARI), and (5) control of dysentery (DYS). Other projects included (1) family planning program (FPP), (2) expanded program of immunization (EPI), (3) oral hydration therapy (ORT), (4) curative services (CUR), and (5) expenditure on research. The analysis of the cost structure is at the activity level and confined to provider's and recurrent cost. To apportion the expenditure on salaries and wages among activities, a time allocation study was undertaken by administering a questionnaire among all employees of the project.

Researchers measured three types of cost-effectiveness indicators: (1) Cost per birth/death averted, (2) average cost to attend/perform/treat one case, and (3) incremental cost to reduce/increase an effectiveness indicator by one point. The Matlab project allocated 40 percent of its total expenditure on research over 4 years (\$138,970; \$156,614; \$178,270; and \$262,945, respectively) and the rest on delivery of services; total cost increased at a real annual rate of 22.5 percent. The growth

rate in total costs for research was 23.7 percent and 21.6 percent for services. Among the activities, family planning and maternity services had the greatest increases, 14.3 percent (\$59,827; \$65,329; \$74,860; and \$89,351) and 19.6 percent (\$0; \$25,542; \$28,111; and \$36,550), respectively. All services increased in cost, except NRU which decreased by 0.1 percent. EPI was the most efficient in cost per death averted (CPDA); CPDA for measles is \$201 per person and for neonatal tetanus is \$294. The CPDA from ARI for neonates, which comprise approximately 50 percent of the mortality estimate, was \$310. MAT seems to be the least efficient; it has averted a total of 42 direct obstetric and neonatal deaths with a CPDA of \$2,158. However, cost per birth averted (CPBA) by the Matlab project averaged \$67 for a total of 4,343 births. The number of births averted increased from 841 in 1986 to 1,343 in 1989 and decreased in CPBA from \$71 in 1986 to \$60 in 1988. Incremental cost varied among all interventions. For FPP, with the increase in contraceptive prevalence rate from 46.4 percent in 1986 to 56.5 percent in 1989, incremental cost decreased from \$35,747 in 1988 to \$19,247 in 1989. Incremental cost per contraceptive user declined from \$133 to \$97. For NRU, while the mortality rate declined from 4.4 percent in 1986 to 3.3 percent in 1989, incremental cost to reduce it by one unit declined from \$114,553 in 1987 to \$93,072 in 1989. The average cost per case treated was calculated for five activities. NRU increased to \$400 per case, ARI and DYS were approximately \$40, EPI was approximately \$2 per immunization, and ORT was \$0.1 per oral rehydration packet. The authors suggest restructuring the present resource allocation pattern for the activities which have already come close to satiety level and continuing to use an enhanced

cost-effectiveness methodology. 6 tables, 2 notes, 10 references.

389

Evaluation of a Communications Program to Increase Adoption of Vasectomy in Guatemala.

Form: Journal article.

Author: Bertrand, J.T.; Santiso, R.; Linder, S.H.; Pineda, M.A.

Source: *Studies in Family Planning*. 18(6):361-370, November-December 1987.

Abstract: Researchers conducted a study to test the impact of three communications strategies (radio and male promoter, radio alone, and male promoter alone) in increasing the adoption of vasectomy in Guatemala and measured the relative cost effectiveness of the three strategies. The strategies were implemented for a 1-year period in three different semirural towns in the southern coastal region of Guatemala, while a fourth community served as a control. The radio promotion consisted of six 30-45-second spots and a series of 36 micro-programs of 10 minutes each, all dealing with family planning, health, and vasectomy. The promoter was a man who had been trained in family planning methods and philosophy (with special emphasis on male sterilization) and in interpersonal communication techniques; he organized groups of men in the community or workplace to discuss family planning, and arranged for interested men to have vasectomies. Evaluation is based on a baseline and followup survey among men in the four communities, service statistics indicating the number of operations performed in the communities since 1979, and data on the cost of producing and implementing the communications program. There was little change in knowledge or attitudes that could be attributed solely to the program (because changes in the treatment

areas were also observed in the control area, possibly because of spill-over). However, the number of operations performed in all three treatment areas increased significantly. The strategy employing the male promoter alone generated the most operations at the lowest cost. It resulted in 98 operations performed at a cost of 3,806 quetzales, as opposed to 47 operations performed in the radio and promoter group at a cost of 14,145 quetzales. (One quetzal equaled one United States dollar at the time of the study.) 2 figures, 6 tables, 17 references.

390

Indonesian Family Planning Program: An Economic Perspective.

Form: Paper.

Author: Chernichovsky, D.; Pardoko, H.; De Leeuw, D.; Rahardjo, P.; Lerman, C.

Source: Washington, DC, World Bank, 185 p., March 1991.

Availability: World Bank, 1818 H Street, NW., Washington, DC 20006. (202) 676-1777.

Abstract: Indonesian Family Planning Program: An Economic Perspective provides Indonesian authorities with data they can use to improve the cost-effectiveness of family planning delivery in Indonesia. It examines resource allocation, cost, funding institutions, and output of the program at the grassroots level in selected regions of three provinces: West Java, the Special District of Yogyakarta, and South Kalimantan. It is based on data from the program's field operations collected from November 1986-March 1987, and routine service statistics of BKKBN (the Indonesian National Family Planning Coordinating Board). Availability of the medical infrastructure to each eligible couple (ELCO) varies greatly among regions. The value of all resources allocated to family planning delivery

ranges from about 270 rupiahs (about \$0.18) per month per ELCO in densely populated Tangerang to 630 rupiahs in sparsely populated South Kalimantan. BKKBN bears about 50 percent of family planning delivery costs, the Ministry of Health about 40 percent, and the community the remaining 10 percent. It is costliest (900 rupiahs per month) to maintain an average user in South Kalimantan. The cost is half that in Tangerang, the least costly area. The intrauterine device (IUD) is the most cost-effective method in the long run, followed by injectable birth control. Major gains in cost effectiveness can therefore be brought about by altering the contraceptive method mix in favor of these more permanent methods. However, implementing this new mix would require capital investment and the training of medical personnel that would strain available resources. The report's chapters include an overview of population and family planning in Indonesia; study specifics; program output; program design and delivery system; field personnel and operations; program cost and cost-effectiveness; worker productivity and efficiency of field operations; and program efficiency. 21 figures, 43 tables, 34 references.

391

Economic Aspects of Singapore's Selective Family Planning Policy.

Form: Journal article.

Author: Evans, D.B.

Source: *Asian and Pacific Population Forum*. 1(4):1-8, 21-24, August 1987.

Abstract: In the mid 1980's Singapore instituted a selective family planning policy that encouraged poorly educated women to prevent pregnancy and discouraged university graduates from using family planning. The policy's intent was to restructure the population and the economy into a more skill-

intensive industrial society and to produce effective leaders for the country's future government. Monetary incentives were offered to both groups of women for their compliance with this policy, including grants to low-income women agreeing to undergo sterilization. Researchers performed a cost-benefit analysis of this policy, considering parameters of economic growth, marginal value product of labor, and consumption levels. They used a time horizon of 30 years and a 10 percent discount rate, with the base year of 1977-1978. The expected net present value in Singapore dollars (in millions) of preventing 1,000 births under those parameters was estimated at \$26.66 for the university group and \$-3.45 for the primary group under high real growth (real growth was calculated using yearly projections of costs and benefits at base-year prices), and at \$29.86 and \$7.00, respectively, under zero real growth. The expected net present value for university graduates under other parameters were almost always positive, implying that the benefits of preventing births among university graduates outweighed the costs. The expected net present value for primary school leavers was often negative, suggesting that preventing the birth of children who will not progress as far academically could cost society more than it gains. Two factors explain these results. First, the cost of a university education is considerably higher than the cost of a primary school education. Second, the timing of the flow of benefits differs between the two groups. The authors conclude that although university-educated people are more productive than uneducated people during their working years, the cost of educating them and the years of work lost due to education outweigh the benefits of their higher productivity. The analysis shows that a selective birth control program based purely on the potential high productivity of the offspring of a particular group need not necessarily be viable economically. 1 table, 19 references.

392

Effectiveness and Cost-Effectiveness of Postpartum IUD Insertion in Lima, Peru.

Form: Journal article.

Author: Foreit, K.G.; Foreit, J.R.; Lagos, G.; Guzman, A.

Source: *International Family Planning Perspectives*. 19(1):19-24, 33, March 1993.

Abstract: Researchers assessed the effectiveness of a postpartum family planning service in contributing to higher contraceptive prevalence and the cost-effectiveness of the family planning program operating costs. The subjects included 1,560 women giving birth in 1988-1989 at the largest hospital of the Peruvian Social Security Institute (IPSS) in Lima, Peru. Two randomly selected maternity wards participated in the study, one as an experimental group and one as a control. Women could have an intrauterine device (IUD), a TCu 380A, inserted immediately after expulsion of the placenta or before hospital discharge. Barrier methods were offered to women who either did not want an IUD or could not be attended by a physician prior to discharge; oral contraceptives were available to women not planning to breast feed. Contraceptive counseling and temporary methods were offered the experimental groups, while a second ward, acting as a control group, was discharged without being offered comparable services. In the second half of the study period, almost 90 percent of the experimental group accepted family planning prior to discharge, and 25 percent of women received an IUD. Followup interviews were conducted after 40 days and 6 months with both the experimental and control groups. Of the 1,560 women, 639 from the experimental group were interviewed at 40 days and 238 at 6 months; 482 from the control group were interviewed at 40 days and 201 at 6 months. At 40 days, 44.7 percent of experimental group and 25.9 percent of the women in the

control group were using a contraceptive method and 27.5 percent of the experimental group and 12.0 percent of the control group were using an IUD. Six months after delivery, 81.8 percent of the members of the experimental group were using a contraceptive method, with 40.3 percent using an IUD; by comparison, 68.7 percent of controls were using a method, and 27.4 percent an IUD. Cost of initial physician training was \$5,100 for fees, travel, and per diem; training for the two patient educators cost \$182 plus \$6,000 per year for salaries and support costs. Costs of postpartum IUD insertion associated with the facility and consumable supplies were estimated at \$7.20 per insertion, plus \$1.02 for the cost of the device (donated by the U.S. Agency for International Development). Training costs were amortized over a 5-year depreciation period. To compute unit costs, researchers calculated that given a 35 percent IUD acceptance rate among 17,250 women delivering per year, 6,000 IUDs could be inserted annually in postpartum services. The total cost of inpatient IUD insertion was estimated to cost \$9.38 per person. IUD insertion on an outpatient basis required two visits. Cost of an outpatient consultation at IPSS was estimated at \$11.57, including costs for facility, personnel, and consumable supplies, so the two visits would cost \$23.14 overall, plus \$1.02 for the cost of the device. Since outpatient clinics did not provide the special family counseling offered by the postpartum program educator, the total cost of the outpatient postpartum IUD insertion was \$24.16. Comparing the inpatient and outpatient insertion costs showed that every inpatient insertion saved \$14.78 and provided special counseling not available through outpatient services. The cost savings of the postpartum service, when applied to the annual maternity caseload for the study hospital, yielded a net savings of \$13,000 per year. If the rate of in-hospital IUD insertions increased to 35 percent, total savings could reach

\$71,700. Researchers estimated that if postpartum IUD insertion was instituted throughout Lima, Peru, potential annual savings could reach \$60,800 to \$94,300, depending on level of demand. Implementing postpartum family planning services in all IPSS hospitals in Lima could save 3 to 5 percent of the annual projected IPSS family planning budget for Lima and free up 6 percent of the current outpatient delivery capacity.

393

Costs and Benefits of Implementing Child Survival Services at a Private Mining Company in Peru.

Form: Journal article.

Author: Foreit, K.G.; Haustein, D.; Winterhalter, M.; La Mata, E.

Source: *American Journal of Public Health*. 81(8):1055-1057, August 1991.

Abstract: Researchers examined whether expenditures for curative child health care could be reduced through preventive interventions and better prescription practices while maintaining or improving quality of care. The study site was a privately owned Peruvian mine that provides medical coverage to approximately 900 dependent children under age 5. Researchers assessed baseline conditions during 1986 and 1987. Data included company records and household and clinic surveys. The household survey included 220 miners' wives. The clinic survey involved 132 consultations with children under age 5. In 1989, after the introduction of preventive health services, researchers conducted a followup to collect service statistics, a campwide census, and a clinical survey of 206 visits by children under age 5. Researchers calculated wholesale costs of medications prescribed at baseline and at followup. The initial study found that despite considerable

outlays for medical services, few children under age 5 were vaccinated and half of their illnesses received no treatment. Children who attended the clinic usually received unnecessary medication. As a result of a prospective cost-benefit analysis finding that family planning and child survival services could improve health status at costs that would be compensated by savings from averted services, the company (1) implemented recommended services, (2) hired additional staff to provide integrated maternal-child preventive health care and family planning, and (3) contracted for intensive training and periodic on-site supervision. In less than 2 years, vaccination reached 75 percent, and virtually all children under age 1 year were enrolled in growth monitoring. Prescriptions were reduced by 24 percent. Mothers accepted well-baby services and had no complaints about reduced medications. The cost of the new services was \$13,000 for the first 2 years. There was a \$6,800 savings in pharmaceuticals prescribed for respiratory infection and diarrhea. 2 tables, 5 references.

394

Family Planning Programmes in Ten Developing Countries: Cost Effectiveness by Mode of Service Delivery.

Form: Journal article.

Author: Huber, S.C.; Harvey, P.D.

Source: *Journal of Biosocial Science*. 21(3):267-277, July 1989.

Abstract: Researchers assessed the cost effectiveness of various modes of family-planning service delivery based on the cost per couple-year of protection (CYP). For this commodity-based measure, the total number of contraceptives distributed or sold in a program is divided by the average number of each type of contraceptive used per couple each year to determine the number of CYP's provided by

each program. The program expenditure is then divided by total CYP's to obtain the cost per CYP of the program in question. Researchers used 1984 data for 63 projects in 10 countries (3 each in Africa and Asia, and 4 in Latin America). These projects provided more than 4.8 million CYP's during the year studied. Results showed that programs with the highest volume of services delivered corresponded to lowest average costs. Social marketing (2.8 million CYP's) and sterilization projects (960,000 CYP's) cost about \$2 per CYP, on average; highest costs were for full service clinics and community-based distribution projects (\$13-\$14 per CYP). Costs of clinics combined with community-based distribution services were approximately \$8-\$9 per CYP, or between the two extremes. Seventy-eight percent of the CYP's studied were provided by the two most cost effective delivery modes, social marketing (58 percent) and clinics offering primarily sterilization (20 percent). This study demonstrates the use of a simple but important tool to assist in planning and management decisions related to cost effectiveness of family planning service delivery. 8 tables, 9 references.

395

Cost-effectiveness of Family Planning in India: The Long-run Average and Marginal Costs.

Form: Journal article.

Author: Juyal, R.K.

Source: *Health Policy and Planning*.

1(2):138-147, June 1986.

Abstract: Researchers conducted a cost-effectiveness analysis of family planning in India by estimating the average cost (AC) and marginal cost (MC) of family planning between 1956 and 1983 to identify long-run trends. They used AC's and MC's to examine the efficacy of reorienting the program during

the fiscal year 1966-1967 by making it target-oriented and time-bound. Researchers used data from the Year Books on the Family Welfare Program pertaining to performance, expenditure, and impact. The analysis measured three variables: Cost per equivalent sterilization, cost per couple protected, and cost per birth averted. Considerable fluctuations were evident with respect to the number of equivalent sterilizations, especially between 1968-1969 and 1977-1978, when the number of sterilizations decreased from 2,089,000 to 1,878,000 and from 8,663,000 to 1,242,000, respectively. Some of the variations in output were directly related to the level of program expenditure, especially between 1972-1973, when the Medical Termination Programme (MTP) was introduced and real marginal expenditures increased by 101.492 million rupees. A similar trend was noted in 1982-1983, when real marginal expenditures increased by 342.768 million rupees. Program expenditure and output in terms of equivalent sterilization were closely related, supporting the view that the output of the family planning program varied directly with variations in program expenditure. The MC and AC curves relative to equivalent sterilizations showed lowest points around 1959-1960 and 1967-1968. Cost curves relating to cost per birth averted showed slightly different patterns of the long-run AC and MC; both decreased over time, with the AC decreasing steadily to an apparent minimum in 1979-1980. The AC showed less sensitivity to short-term changes and implied that the cost per equivalent sterilization was a better indicator of operational efficiency. 5 figures, 3 tables, 23 references.

396

Paying for Family Planning.

Form: Serial.

Author: Lande, R.E.; Geller, J.S.

Source: *Population Reports*. Series J: Family Planning Programs. (39):1-31, November 1991.

Abstract: Paying for Family Planning discusses the challenges and costs involved in meeting the future needs for family planning in developing countries. Estimates of current expenditures for family planning in the developing world are as high as \$4.5 billion. According to the United Nations Population Fund, governments in developing countries contribute 75 percent of the payments for family planning, donor agencies contribute 15 percent, and users pay for 10 percent.

Although current expenditures cover the needs of 315 million couples of reproductive age in developing countries, this number of couples accounts for only 44 percent of all married women of reproductive age. Meeting all current contraceptive needs would require an additional \$1-\$1.4 billion. By the year 2000, as many as 600 million couples could require family planning, costing as much as \$11 billion a year. While most of the responsibility for covering these costs will remain the domain of governments and their donor agencies (governments spend only 0.4 percent of their total budget on family planning and only 1 percent of all development assistance goes toward family planning), the authors suggest that a wide array of approaches can be used to help meet added costs. Detailed discussions are presented for the following approaches: (1) Retail sales and fee-for-service providers, which involve an expanded role for the commercial sector and an increased emphasis on marketing; (2) third-party coverage, which means paying for family planning services through social security institutions, insurance plans, and the like; (3)

public-private collaboration (social marketing, employment-based services); (4) cost recovery, such as instituting fees in public and private nonprofit family planning clinics; and (5) improvements in efficiency of service delivery, promotion, and evaluation. 4 tables, 244 references.

397

Cost Effectiveness of the APROFAM Program for Voluntary Surgical Contraception in Guatemala.

Form: Journal article.

Author: McBride, M.E.; Bertrand, J.T.; Santiso, R.; Fernandez, V.H.

Source: *Evaluation Review*. 11(3):300-326, June 1987.

Abstract: A study examined the relative cost effectiveness of five alternative service delivery methods for providing voluntary surgical contraception (VSC) in Guatemala. The study focused primarily on the relative effectiveness of providing VSC in the country's interior using fixed facilities with local doctors or mobile teams. The VSC program was administered by the Asociacion ProBienestar de la Familia (APROFAM). Service delivery modes included a surgical center, private clinics, and APROFAM clinics. Two types of cost data were used: Actual expenditures and shadow pricing for items that constituted inputs to the program but were not charged to the contract. The coding procedure for cost data consisted of coding each line item from the monthly expenditure reports on a series of variables, including the type of resource it was and the type of service delivery model for which it was used. The output measure used in this cost effectiveness analysis (CEA) was the total number of sterilizations performed at each location by funding period. The total cost of the VSC program between March 1979 and June 1984 was Quetzales (Q)

2,868,939. The retrospective CEA showed that the mobile teams are relatively more expensive (\$201,302 and \$324,002, respectively) than using local doctors (\$451,171 and \$1,196,316, respectively). This result was tempered by an analysis of the monthly cost and service statistics using statistical cost techniques. An alternative analysis revealed that, at the margin, with the given stock of capital the mobile teams are relatively cheaper to use, and that the fixed facilities need high demand levels (which are unlikely to occur in the interior) to achieve low costs at the margin. The alternative analysis led to the funding agency retaining the mobile team model. 3 figures, 7 tables, 12 references.

398

Cost-Benefit Analysis of the Mexican Social Security Administration's Family Planning Program.

Form: Journal article.

Author: Nortman, D.L.; Halvas, J.; Rabago, A.

Source: *Studies in Family Planning*. 17(1):1-6, January-February 1986.

Abstract: Researchers conducted a cost benefit analysis of the family planning program of the Mexican Social Security System (IMSS) to test the hypothesis that IMSS's family planning services would yield a net savings to IMSS by reducing the load on its maternal and infant care service. The study examined the years 1972-1984. The study methodology consisted of four components: (1) An annual time series of IMSS cost for contraceptive recruitment and supply; (2) computation of the annual number of averted births based on the CONVERSE model; (3) an estimate based on empirical data regarding annual number of averted IMSS treatments for incomplete abortions; and (4) an annual time series of

IMSS expenditure per pregnant and postpartum woman, per incomplete abortion treated, and per child cared for during the first year of life. In 1984, researchers conducted a field survey of 37 IMSS hospitals and 16 clinics in 13 of Mexico's 32 states to determine IMSS expenditures on family planning services and maternal and infant care. The survey retrospectively and prospectively monitored cost per minute or day and number of minutes or days for family planning, first time and subsequent visits of IUD and hormone acceptors, and female and male sterilization. Researchers looked at expenditure on pregnant and postpartum women and IMSS expenditure per case. The results indicated that the IMSS family planning program considerably reduced the demand on its maternal and infant care services. The program averted a total of 3,556,700 births and 362,700 treatments for incomplete abortion through 1985. The cost per averted birth plus incomplete abortion ranged from an average of 90,000 pesos (1983 currency) in the first year of operation to a low of 5,800 pesos in 1983. Excluding any financial input in 1985, the average cost per averted birth and incomplete abortion during 1972 through 1985 was 9,700 1983 pesos or about \$65. As a consequence of its family planning program, IMSS was able to divert a total of 318 billion pesos during 1972-1985 from maternal and infant care to payments for pensions and general health services. 1 figure, 4 tables, 5 references.

399

Potential Uses of Cost Analyses in Child Survival Programmes: Evidence From Africa.**Form:** Journal article.**Author:** Qualls, N.L.; Robertson, R.L.**Source:** *Health Policy and Planning*.

4(1):50-61, March 1989.

Abstract: Researchers determined how cost analyses help international health care specialists to monitor service delivery, evaluate activities, plan for improvements in programs, and arrange for adequate financing. They used results from child survival programs in Africa, with particular emphasis on evaluations of selected national program components from the Combatting Childhood Communicable Diseases (CCCD) Project. The CCCD Project emphasizes three categories of childhood diseases, (1) vaccine preventable diseases (EPI), (2) acute diarrhoeal diseases (ORT), and (3) malaria, and delivers preventive health services to children under 5 years of age in Africa. Researchers studied overall total costs and their distribution among sources of funds and types of inputs on a CCCD Project in Swaziland and Malawi in 1984-1985. The total costs and cost per capita for the program components of EPI were \$1,588,776 and \$0.24 for Malawi and \$412,542 and \$0.60 for Swaziland. The total costs and cost per capita for the program components of ORT were \$396,842 and \$0.06 for Malawi and \$374,491 and \$0.54 for Swaziland. The total costs and cost per capita for the program components of malaria were \$1,324,661 and \$0.20 for Malawi and \$162,219 and \$0.24 for Swaziland. Data on the costs per out-patient for diarrhoeal disease treatment in Malawi (in Kwacha) and in Swaziland (in Emalangeni) included total cost, number of out-patient cases, and average cost per case. The average costs per case in Malawi clinics (in U.S. dollars) were in Kamuzu, \$1.07; in Mangochi,

\$0.42; in Nathonje, \$0.17; in Nankhumba, \$8.47; and in Chonde, \$0.27. The average costs per case in Swazi clinics (in U.S. dollars) were \$3.98 in Raleigh Fitkin; \$4.83 in Good Shepherd; \$4.57 in Mankayane; \$4.14 in Emkhuzweni; \$19.06 in Sitobela; \$2.25 in Balekane; \$2.45 in Lavumisa; \$3.18 in Lomahasha; \$3.49 in Lubuli; \$3.34 in Mafutseni; \$4.14 in Ngonini Estates; and \$0.72 in Siphofaneni. Data on the costs per immunization dose in Malawi (in Kwacha) and in Swaziland (in Emalangeni) included total cost, number of doses, and average cost per dose. The average costs per dose in Malawi clinics (in U.S. dollars) were in Kamuzu, \$1.67; in Dedza, \$1.58; in Queen Elizabeth, \$0.56; in Mulanje, \$0.69; in Nkhata Bay, \$4.12; in Kabadula, \$2.13; in Kaphuka, \$1.50; in Chinteché, \$2.08; in Kawale, \$.46; in Bembeke, \$1.92; in Limbe, \$0.10; in Monkey Bay, \$0.84; in Nankhumba, \$0.88; in Chonde, \$0.27; in Phalombe, \$0.10; in Milonde, \$0.55; in Mbamba, \$0.39; and in Maula, \$0.35. The average costs per dose in Swazi clinics (in U.S. dollars) were in King Sobhuza II, \$4.78; in Mbabane, \$6.56; in Raleigh Fitkin, \$1.31; in Good Shepherd, \$1.45; in Mankayane, \$4.55; in Emkhuzweni, \$1.94; in Havelock Mine, \$3.83; in Sitobela, \$9.33; in Balekane, \$1.71; in Lavumisa, \$0.91; in Lomahasha, \$0.99; in Lubuli, \$2.89; in Mafutseni, \$1.45; in Mliba, \$2.28; in Ngonini Estates, \$5.01; in Siphofaneni, \$1.63; and in Siteki \$3.45. A comparison of the cost profiles for the full CCCD Project of Malawi and Swaziland and of specific local health care facilities within those countries indicated major differences in personnel costs. The fully vaccinated child costs for Malawi and Swaziland were \$11.48 and \$50.57, respectively. In comparison with Malawi, Swaziland had a significantly higher cost per dose, \$2.58 versus \$0.99 and a greater number of doses required for full vaccination status. The Swazi ratio of vaccine doses consumed to vaccinations delivered for all types except

tetanus, was 2.42; the Malawi ratio was 1.56. Swazi programs had higher vaccine loss and wastage rates. Researchers determined that Swazi EPI officials needed to review policies and practices on vaccine handling to improve efficiency. Malawi had a larger number of health care facilities, with more data limitations, than Swaziland; however, Malawi's operations and estimations for uses of staff time were better.

400

Employment-Based Family Planning Programs.

Form: Serial.

Author: Rinehart, W.; Blackburn, R.; Moore, S.H.

Source: *Population Reports*.

Series J: Family Planning Programs.
(34):921-951, September-October 1987.

Abstract: The authors examine family planning in developing countries and discuss how such services in the workplace make sense for both employers and employees. Large manufacturers and plantations in India first offered family planning to workers in the 1950's. Now many large companies have added family planning to other health services in such locations as Indonesia, the Philippines, Thailand, South Korea, Turkey, Egypt, and Kenya. In some Latin American countries, social security systems have provided family planning for many workers. The type of groups that run employment-based programs in various countries include companies, labor unions, government-sponsored social marketing programs, and the military. Services are offered in workplace clinics, through referrals, in freestanding facilities, in social security hospitals, and in community-based clinics. Funding comes from employers, governments, unions, family planning associations, and the United States

Agency for International Development (USAID). The most effective programs offer supplies and services as well as information, offer them directly at the workplace, and use volunteer workers to distribute birth control pills and condoms. Successful programs require the full support of company management. ElectroLima (an electric utility in Peru) provides health care for almost 2,500 married women between ages 20-49. It found that savings (\$55,000) could exceed costs (\$30,000) by more than two to one in the third year of a program, for total savings of \$25,000. This type of favorable cost-benefit projection can show managers that offering family planning makes financial sense and also contributes to employee health. 218 references.

401

Health Spending, Delivery, and Outcomes in OECD Countries.

Form: Journal article.

Author: Schieber, G.J.; Poullier, J.; Greenwald, L.M.

Source: *Health Affairs*. 12(2):120-129, Summer 1993.

Abstract: Researchers analyzed and compared health expenditures in 24 industrialized nations between 1985 and 1991. They discussed availability and use of inpatient medical care and physician services and data on infant mortality and life expectancy. The ratio of health spending to gross domestic product (GDP) ranged from 2.8 percent in Turkey to 10.5 percent in the U.S. in 1985 and 4.0 percent in Turkey to 13.2 percent in the U.S. in 1991. Over the same period, the average health-to-GDP Organization for Economic Cooperation and Development (OECD) ratio increased from 7.2 to 7.9 percent. Per capita spending was calculated on the basis of GDP purchasing power parities (PPP's) for 1985 to

1991. In 1985, per capita spending ranged from \$66 in Turkey to \$1,711 in the U.S., with an OECD average of \$855. By 1991, per capita health expenditures ranged from \$142 in Turkey to \$2,868 in the U.S., with an OECD average of \$1,305. Researchers analyzed five additional measures of health spending performance for Canada, France, Germany, Japan, the United Kingdom and the U.S. based on national currencies: (1) Compound annual growth rates in nominal per capita health spending, (2) real (medical price-adjusted) per capita health spending, (3) real (GDP deflator-adjusted) per capita health spending, (4) excess health care inflation, and (5) the nominal elasticity of per capita health spending relative to per capita GDP. The U.S. had the highest rates of growth in real health spending (5 percent), excess medical care inflation (2.3 percent), and highest nominal elasticity of health spending relative to GDP (1.7). In growth in nominal per capita health spending and real per capita spending, the U.S. ranked second (9 percent, slightly below the U.K. rate of 9.9 percent) and third (2.7 percent, behind Japan at 4.5 and France at 4.3), respectively. Availability and use of services measures included 1990 information on (1) inpatient medical care, (2) beds per thousand population, (3) inpatient days per capita, (4) admission rates, (5) average lengths-of-stay, (6) occupancy rates, (7) number of employees per bed, (8) number of physicians per thousand, and (9) physician contacts per capita. The number of inpatient medical care beds ranged from 2.1 beds per thousand in Turkey to 16.7 beds in Iceland, 4.7 beds in the U.S. (fourth lowest), and an OECD average of 9.0 beds. Days per capita ranged from 0.4 days per person per year in Turkey to 5.1 days in Iceland, 1.2 days in the U.S. (fifth lowest), and an OECD average of 2.7 days. The percentage of population admitted to an inpatient medical care facility varied from 5.6 percent in Turkey to 27.5 percent in Iceland, 13.7 percent in the U.S., and an OECD

average of 16.6. Average length of stay per admission varied from 6.9 days in Turkey to 50.5 in Japan, 9.1 days in the U.S., and an OECD average of 15.7 days. Occupancy rates ranged from 56.9 percent in Turkey to 88.5 percent in the Netherlands, 69.5 percent in the U.S., and an OECD average of 78.5. Number of employees ranged from 0.8 in Austria and Japan to 3.9 in Australia, 3.4 in the U.S. (ranked second), and an OECD average of 2.0. Physicians-to-population ratios ranged from 0.9 per thousand in Turkey to 3.8 in Spain, 2.3 in the U.S., and an OECD average of 2.4. Physician contacts per capita ranged from 2.0 in Turkey to 12.9 in Japan, 5.5 contacts in the U.S., and an OECD average of 6.2. Health outcome measures for 1990 included (1) infant mortality, (2) life expectancy at birth, and (3) life expectancy at eighty. Infant mortality rates ranged from 4.6 deaths per thousand live births in Japan to 59.3 deaths in Turkey, 9.1 in the U.S., and an OECD average of 9.7 deaths (7.5 excluding Turkey). Male life expectancy at birth ranged from 75.9 years in Japan to 64.1 years in Turkey, 72 years in the U.S., and an OECD average of 72.6 years. Female life expectancy ranged from 81.9 years in Japan to 68.4 years in Turkey, and 78.8 years in the U.S. and in the OECD. Male life expectancy at 80 ranged from 7.4 years in Iceland to 5.2 years in Turkey, 7.1 years in the U.S., and 6.4 years for an OECD average. Female life expectancy at 80 ranged from 9.3 years in Canada to 5.9 years in Turkey, 9.0 years in the U.S., and 8 years for an OECD average. The authors suggested that the lack of a coordinated and comprehensive system for providing preventive and prenatal care to the entire population accounted for the lower scores for the U.S. system; however, that the U.S. had a larger pool of money with which to transform its current system into one that meets other nations' standards of universal coverage and containment of costs.

402

**Third World Family Planning Programs:
Measuring the Costs.**

Form: Journal.

Author: Yinger, N.; Osborn, R.;
Salkever, D.; Sirageldin, I.

Source: *Population Bulletin*. 38(1):1-36,
February 1983.

Abstract: This population bulletin is based on papers presented at the International Workshop on Cost-Effectiveness Analysis (CEA) and Cost-Benefit Analysis (CBA) in Family Planning Programs, held in August 1981 in St. Michaels, Maryland. Researchers explain and demonstrate the use of CBA and CEA in evaluating Third World family planning programs. CBA, which aids decisions on alternate uses of investment funds (for example, family planning versus new schools), helped convince Third World governments to adopt family planning programs because of their economic value in overall development. CEA is a technique that can show which family planning delivery systems work best for the money expended as measured, for example, by cost per acceptor, per couple-year of protection (CYP) against the risk of pregnancy, or per birth averted. This is increasingly necessary in the 1980's as funds for family planning are being pinched in both developing and donor countries. At the same time, researchers estimate that annual expenditures on family planning in the Third World must rise from the current \$1 billion to \$64 billion by the year 2000 if this population is eventually to be stabilized. Researchers present nine case studies from Brazil, Colombia, Ghana, Haiti, India, Thailand, and Zaire to demonstrate what CEA has revealed about such issues as integration of family planning with health services, use of paramedical staff and community-based distribution to promote contraceptive use, and important factors to include to ensure

comparability of findings. CEA can be improved to make it more useful in practice by (1) including all inputs, (2) evaluating services and methods, (3) relying less on cost per acceptor, (4) considering user characteristics, and (5) building the data needed into the project at the planning stage. Little cost information is included in the article and what exists is not comparable among the different countries. 3 figures, 5 tables, 29 references.

International Health

References

R403

Impact of Development Programmes on Fertility in Bangladesh.

Form: Journal article.

Author: Barkat-e-Khuda, B.; Howaldar, S.; Harbison, S.P.

Source: *Demography India.* 17(1):1-18, January-June 1988.

R404

Maternal Tetanus Immunization in ACEH Province, Sumatra: The Cost-effectiveness of Alternative Strategies.

Form: Journal article.

Author: Berman, P.; Quinley, J.; Yusuf, B.; Anwar, S.; Mustaini, U.; Azof, A.; Iskandar.

Source: *Social Science and Medicine.* 33(2):185-192, 1991.

R405

Cost-Benefit Analysis of Thailand's Family Planning Program.

Form: Journal article.

Author: Chao, D.; Allen, K.B.

Source: *International Family Planning Perspectives.* 10(3):75-81, September 1984.

R406

Evaluation of the Cost-Effectiveness of Mobile Family Planning Services in Tunisia.

Form: Journal article.

Author: Coeytaux, F.; Donaldson, D.; Aloui, T.; Kilani, T.; Fourati, H.

Source: *Studies in Family Planning.* 20(3):158-169, May-June 1989.

R407

New Hope in Dark Times: An Assessment By the United Nations Children's Fund of a Child Survival Package: Its Effectiveness and Its Social and Economic Feasibility.

Form: Book chapter.

Author: Cornia, G.A.

Source: IN: *Mortality and Health Policy: Proceedings of the Expert Group on Mortality and Health Policy, Rome, 30 May to 3 June 1983.* United Nations, Department of International Economic and Social Affairs. New York, NY, United Nations, pp. 229-247, 1984.

Availability: United Nations, New York, NY 10017.

R408

Impact of Breast Milk on the Cost-Effectiveness of the Special Care Unit for the Newborn.

Form: Journal article.

Author: Daga, S.R.; Daga, A.S.

Source: *Journal of Tropical Pediatrics.* 31(2):121-123, April 1985.

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Why Promote Breastfeeding in Diarrhoeal Disease Control Programmes?

Form: Journal article.

Author: De Zoysa, I.; Rea, M.; Martines, J.

Source: *Health Policy and Planning*.

6(4):371-379, December 1991.

R410

Family Planning and Health: The Narangwal Experiment.

Form: Journal article.

Author: Faruqee, R.

Source: *Finance and Development*.

20(2):43-46, June 1983.

R411

Illegal Abortion: An Attempt to Assess its Cost to the Health Services and Its Incidence in the Community.

Form: Journal article.

Author: Figa-Talamanca, I.;

Sinnathuray, T.A.; Yusof, K.; Fong, C.K.;

Palan, V.T.; Adeeb, N.; Nylander, P.;

Onifade, A.; Akin, A.; Bertan, M.;

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Source: *International Journal of Health Services*. 16(3):375-389, 1986.

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Costs and Benefits of Implementing Family Planning Services at a Private Mining Company in Peru.

Form: Journal article.

Author: Foreit, K.G.; Haustein, D.; Winterhalter, M.; La Mata, E.

Source: *International Family Planning Perspectives*. 17(3):91-95, September 1991.

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Benefit-Cost Analysis of the Indian Family Welfare Programme.

Form: Journal article.

Author: Gopal, K.R.

Source: *Indian Economic Journal*.

31(4):45-52, April-June 1984.

R414

Malaria Chemoprophylaxis Compliance in Pregnant Women: A Cost-effectiveness Analysis of Alternative Interventions.

Form: Journal article.

Author: Helitzer-Allen, D.L.;

McFarland, D.A.; Wirima, J.J.;

Macheso, A.P.

Source: *Social Science and Medicine*.

36(4):403-407, February 1993.

R415

Antenatal Chloroquine Chemoprophylaxis in Malawi: Chloroquine Resistance, Compliance, Protective Efficacy and Cost.

Form: Journal article.

Author: Heymann, D.L.; Steketee, R.W.; Wirima, J.J.; McFarland, D.A.; Khoromana, C.O.; Campbell, C.C.

Source: *Transactions of the Royal Society of Tropical Medicine and Hygiene.*
84(4):496-498, July-August 1990.

R416

Cost Analysis of Family Planning Service in a Primary Health Care Center in Bangladesh.

Form: Journal article.

Author: Hussain, A.

Source: *International Center for Medical Research Annals.* 3:17-30, 1983.

R417

Strategies for the Control of Neonatal Tetanus.

Form: Journal article.

Author: Kessel, E.

Source: *Journal of Tropical Pediatrics.*
30(3):145-149, June 1984.

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Risks and Costs of Illegally Induced Abortion in Bangladesh.

Form: Journal article.

Author: Khan, A.R.; Begum, S.F.; Covington, D.L.; Janowitz, B.; James, S.; Potts, M.

Source: *Journal of Biosocial Science.*
16(1):89-98, January 1984.

R419

Can Low Income Women in Developing Countries Afford Artificial Feeding?

Form: Journal article.

Author: Melville, B.F.

Source: *Journal of Tropical Pediatrics.*
37(3):141-142, June 1991.

R420

Demand for and Cost-benefit Analysis of Family Planning Services in the Private Sector in Nigeria.

Form: Book chapter.

Author: Oyekanmi, F.D.

Source: IN: *African Population Conference/Congres Africain de Population.*
Dakar, Senegal; Liege, Belgium, International Union for the Scientific Study of Population, pp. 2.4.49-2.4.71, 1988.

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Thai Expanded Programme on Immunization: Role of Immunization Sessions and Their Cost-effectiveness.

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Author: Phonboon, K.; Shepard, D.S.; Ramaboot, S.; Kunasol, P.; Preuksaraj, S.

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Demographic Impact and Economic Implications of the Family Planning Programme in Uttar Pradesh.

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Author: Sawhney, N.; Kumar, M.

Source: *Journal of Family Welfare.*
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Cost-Effectiveness Analysis of Family Planning Programs in Rural Bangladesh: Evidence From Matlab.

Form: Journal article.

Author: Simmons, G.B.; Balk, D.; Faiz, K.K.

Source: *Studies in Family Planning.*
22(2):83-101, March-April 1991.

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Social Marketing of Contraceptives in Bangladesh.

Form: Journal article.

Author: Schellstede, W.P.; Ciszewski, R.L.

Source: *Studies in Family Planning.*
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Prevention of Neonatal Tetanus in India: A Prospective Cost-effectiveness Analysis.

Form: Journal article.

Author: Smucker, C.M.; Swint, J.M.; Simmons, G.B.

Source: *Journal of Tropical Pediatrics.*
30(4):227-236, August 1984.

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Price and Income Elasticities of Demand for Modern Health Care: The Case of Infant Delivery in the Philippines.

Form: Journal article.

Author: Schwartz, J.B.; Akin, J.S.; Popkin, B.M.

Source: *World Bank Economic Review.*
2(1):49-76, January 1988.

R428

Antenatal Screening for Fetopelvic Dystocias: A Cost-effectiveness Approach to the Choice of Simple Indicators for Use By Auxiliary Personnel.

Form: Journal article.

Author: Van Lerberghe, W.; Van Balen, H.

Source: *Journal of Tropical Pediatrics.*
87(4):173-183, August 1984.

R425

Cost-effectiveness of the Expanded Programme on Immunization in the Ivory Coast: A Preliminary Assessment.

Form: Journal article.

Author: Shepard, D.S.; Sanoh, L.; Coffi, E.

Source: *Social Science and Medicine.*
22(3):369-377, 1986.

Methods

429

Cost-Effectiveness in Healthcare: Complexity of the Equation.

Form: Journal article.

Author: Archambault, A.

Source: *Journal of the Canadian Dietetic Association*. 49(2):80-85, Spring 1988.

Abstract: Identifying and valuing costs and benefits, measuring effectiveness, and assessing quality of life are complex and difficult issues. A researcher discussed these issues in reference to Canadian studies on the cost effectiveness of nutrition support and stressed the need for further research to improve cost effectiveness of nutrition support. The paper presented definitions of the concepts cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) and outlined the set of basic steps followed in CBA and CEA. Detsky and Jeejeebhoy used cost-effectiveness analysis to compare three strategies for reducing incidence of severe nutrition-associated complications in patients undergoing major gastrointestinal surgery. These authors used a decision tree reflecting the structure of possible outcomes for three possible strategies: (1) Treat all patients with parenteral nutrition support (PNS) for 10 days before surgery; (2) treat no patients with preoperative parenteral nutrition support; and (3) perform a test that stratifies patients, and treat only the high risk patients. Comparison of the test strategy with the strategy to treat all patients showed that fewer patients would develop iatrogenic complications (IC's), whereas more would develop nutrition associated complications (NAC's). Comparison of the test strategy with the strategy to treat no patients showed that fewer patients would develop NAC's whereas more would develop IC's. This trade-off of IC's for NAC's with the test strategy is the key to the risk-benefit analysis. The results of

Detsky and Jeejeebhoy suggest that preoperative PNS may prove to be very cost effective in some clinical circumstances despite its high cost. The author also discusses measures of effectiveness used in economical appraisal of health care programs for resource allocation decisions. Outputs from health programs and interventions can be measured (1) in units inherent to the program or disease treated, i.e., cases detected, cases prevented, lives saved, or life years gained; (2) in economic benefits associated with health improvements, i.e., direct benefits in saving health care costs, indirect benefits in productivity gains because patients are well and able to work, or intangible benefits of reduction in pain and suffering to the patient and family; and (3) the value of the health improvement to the patient, family, or society regardless of any economic consequences. Approaches can be classified into three groups: (1) Use of ad hoc numeric scales, assessing the patient on aspects of his or her health; (2) use of basic techniques for valuing health benefits, including human capital and willingness to pay; and (3) use of utilities and quality-adjusted life-years (QALY's), giving utilities cardinal values assigned to each health state, values that reflect the quality of health states, and values that allow morbidity and mortality improvements to be combined into a single weighted measure of QALY's gained. Detsky et al. performed an economic evaluation of a home parenteral nutrition (HPN) program by measuring incremental costs and health outcomes for 73 patients between 1970 and 1982. Over a 12-year time frame, HPN resulted in a net savings in health care costs of \$19,232 per patient and an increase in survival adjusted for quality of life of 3.3 years compared with the alternative of treating these patients in the hospital with intermittent nutritional support when needed. Detsky et al. estimated that HPN resulted in incremental

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costs of \$48,180 per patient over 12 years, or \$14,600 per QALY gained. 1 figure, 11 references.

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Modeling Resource Allocation for Child Survival.

Form: Book chapter.

Author: Barnum, H.N.; Barlow, R.

Source: IN: *Child Survival: Strategies for Research*. Mosley, W.H.; Chen, L.C.; eds. New York, NY, Cambridge University Press, pp. 367-387, 1984.

Availability: Cambridge University Press, 40 West 20th Street, New York, NY 10011.

Abstract: Modeling Resource Allocation for Child Survival is a chapter in *Child Survival: Strategies for Research*. The chapter presents a framework to provide a direct assessment of health interventions designed to raise the probability of child survival in a hypothetical community. Direct interventions are a practical way to improve the rate of child survival in developing countries. Despite technical feasibility, resource constraints restrict the adoption of projects; health programs must therefore also be examined with respect to economic feasibility. Questions that arise include the cost effectiveness of curative versus preventive care; indirect versus direct health services; the choice of appropriate population targets; the relative importance of nutrition interventions; and identifying constraining resources as well as estimating the benefits to be derived from additional resources. Salient features of the proposed model include the use of interactive simultaneous equations to model the causes of death in a setting of multiple diseases, the clear distinction between preventive activities affecting morbidity and curative activities affecting case fatality rates, and the separation of the early childhood period into age

subgroups with distinct morbidity characteristics. The optimization model also distinguishes between program use and program availability, and sets intervention levels that tend to equilibrate use and availability. The three types of structural equations in the model generate the rates for intervention use, marginal disease incidence, and fatality. The interventions selected for a hypothetical resource-poor community are health promotion, breast feeding, latrines, water, well-baby clinics, tetanus immunization, iron fortification tablets for all women, and outpatient services for infants in the first 28 days. Results indicate that inpatient care and hospital deliveries are not cost effective, and are not adopted by the optimization program until community resources reach high levels. Nutrition interventions deserve special emphasis, and timing is crucial to the cost effectiveness of prenatal care. 4 figures, 2 tables.

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Health Service Efficiency: Appraising the Appraisers. A Critical Review of Economic Appraisal in Practice.

Form: Journal article.

Author: Blades, C.A.; Culyer, A.J.; Walker, A.

Source: *Social Science and Medicine*. 25(5):461-472, 1987.

Abstract: Researchers presented a critical appraisal of the application of economic evaluative techniques to problems of health service efficiency. They focused largely on the British literature and selected some recurring issues, commented on them from a theoretical point of view, and illustrated them with examples of good and bad practice. The paper is organized into four sections: (1) An introduction, (2) treatments of cost, (3) treatments of benefit, and (4) design and

presentational issues. Treatments of cost include (1) the concept of opportunity cost, (2) the breadth of coverage of costs, (3) the treatment of averted costs, (4) the art of spotting and measuring marginal costs, and (5) discounting. A study by Culyer and Maynard (1981) discussed medical and surgical alternatives in the treatment of duodenal ulcers; inclusion of the cost of surgical fatalities produced a range of cost per case for the surgical option of 1,180 to 16,370 British pounds, relative to a range for the medical option of 1,020 to 1,240 pounds. Excluding these costs brought the cost per surgical case down to 950 to 1,370 pounds. In a marginal cost analysis in the United States, in screening for asymptomatic colon cancer (Neuhauser and Lewicki 1975), while the average cost per case detected using a protocol with six sequential tests was only \$2,451, the incremental cost per case detected by performing a sixth test (having already completed five tests) was \$47 million. Most of the studies point out the variety with which breadth is treated in practice and urge analysts on to the greatest possible breadth. One study that took a very comprehensive view of the breadth of coverage was that by Hagard et al. This study sought to identify the costs and economic benefits of a program for the mass screening of pregnant women for early detection and abortion of fetuses with neural tube defects. The costs of the program were seen as falling primarily on the health service but a significant portion of costs (28 percent) also fell on patients. Relevant marginal costs are often exceedingly elusive and even sophisticated practitioners have often failed to spot them, often as a result of screening procedures. All studies urge the discounting of costs and benefits. Discounting is likely to make a difference in the relative attractiveness of alternatives when the time profile of costs is substantially different as between the options. Benefits can be evaluated through (1) cost-effectiveness analyses, (2) cost-utility analyses, and (3) cost-benefit

analyses. Researchers discuss the output measures and outcome measures as related to monetary and nonmonetary assessment. Design and presentation of studies should encompass a variety of alternatives, sensitivity and robustness in the data analyses, and decision indexes for ranking and distribution of costs and benefits. Researchers should also be aware of quantophrenia, a condition characterized by the quantified driving out the important. 4 tables, 59 references.

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Problems and Prospects in the Economic Evaluation of Antenatal Care.

Form: Journal article.

Author: Buhaug, H.

Source: *International Journal of Technology Assessment in Health Care.*
8(Supplement 1):49-56, 1992.

Abstract: The author elaborates on (1) the basic elements of an economic evaluation (antenatal care, health status, resource use, productive output, health outcome, net cost, and comparison); (2) health outcomes and effectiveness; and (3) changes in antenatal care programs. He presents preliminary results from a antenatal cost study being conducted in Oppland, Norway to illustrate his views. The average cost of routine antenatal care per expectant mother was Nkr 2,840 with the first visits accounting for more than 20 percent of the average cost. The average number of visits was 11. Assuming that there is an additional basic cost of each visit, close to 50 percent of the cost is due to the number of visits only and not to the procedures being performed. Thus, the cost of routine antenatal care is only a small fraction of the total cost associated with pregnancies. Average outpatient cost per pregnant woman was Nkr 2,087 and the average cost per inpatient case was Nkr 13,400. The average cost per

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delivery was Nkr 12,868. Loss of productive output due to health problems during pregnancy is the largest cost component. This cost average per pregnant woman was Nkr 17,273. The range was Nkr 0-175,900 (278 days), yet fifty-two percent did not have a sick leave during pregnancy. After reviewing this study, he asserts that (1) economic evaluations can be used to compare alternative antenatal care programs in terms of cost and outcome, (2) the cost of routine antenatal care is small compared to the total cost associated with pregnancy and childbirth, and (3) the main problem in economic evaluations is related to outcome measurement. 3 tables, 3 figures, 5 references.

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Measuring Costs and Financial Benefits in Randomized Controlled Trials.

Form: Journal article.

Author: Bulpitt, C.J.; Fletcher, A.E.

Source: *American Heart Journal*.

119(3, Part 2):766-771, March 1990.

Abstract: Researchers measured the costs and financial benefits in randomized controlled trials using three main types of evaluation: (1) Cost-effectiveness analysis (CEA), (2) cost-utility analysis (CUA), and (3) cost-benefit analysis (CBA). The costs included direct costs of medical-related care and indirect costs of productivity losses or those associated with illness, measured by loss of earnings. Economic benefits were defined as when a treatment program results in an increase in earnings, measured in natural units, e.g., health effects and utility units, e.g., quality-adjusted life years (QALY's). A CEA using 1987 prices in British pounds and measured in biologic units (mm Hg) was done on the results of a double-blind trial that compared the use of verapamil and propranolol in the treatment of patients with hypertension.

Verapamil (average dose 160 mg, twice daily) lowered systolic blood pressure by 17.1 mm Hg and diastolic by 17.3 mm Hg at a cost of 42 British pounds; propranolol (average dose 120 mg, twice daily) lowered systolic blood pressure by 9.3 mm Hg and diastolic by 11.0 mm Hg at a cost of 16 British pounds. The verapamil more effectively lowered systolic blood pressure by 7.8 mm Hg and diastolic by 6.3 mm Hg at an additional cost of 26 British pounds per dose. The marginal costs for systolic and diastolic pressures were 2.46 mm Hg and 2.43 mm Hg for verapamil and 1.72 mm Hg and 1.45 mm Hg for propranolol. The CEA outcome indicated that 1 mm Hg reduction was achieved at a cost of 3.33 pounds per mm Hg for systolic and 4.13 pounds per mm Hg for diastolic. The CUA was 140 pounds per QALY for verapamil and 57 pounds for propranolol. The full cost of a QALY with verapamil was 1,300 British pounds. The CUA calculated the QALY's by integrating the survival with a measure of quality of life, the Health Status Index. A CBA measured the consequences of intervention in a hospital-based mental health program in the United States. The hospital-based program proved less expensive at \$797 per patient per year than a community-based program. However, when the indirect benefit of patient earnings was taken into account, patients in the community-based program earned twice as much as those in the hospital-based program for a net benefit of \$399 per patient per year for community care. Researchers also performed a CBA on the use of naftidrofuryl in the treatment of acute cerebral hemisphere infarction using 100 patients eligible for drug treatment. In the treatment of acute cerebral hemisphere infarction, the direct costs were \$3,260 million, the indirect costs were \$438 million, and the present value of future earnings, with a 6 percent discount rate, was \$3,666 million. Data from the United Kingdom indicated that naftidrofuryl therapy reduced hospital stays by

an average of 25 days, or freed resources of 550 British pounds. In a randomized controlled 6-month trial of auranofin for the treatment of rheumatoid arthritis, researchers included quality of life measures. The Health Status Index, on the Quality of Well-Being Scale showed a significant +0.02 improvement with auranofin. The CBA showed an increase in costs of \$707 per year on placebo and \$1,563 per year on auranofin, or \$856 in extra costs. The investigators did not perform a CUA on the auranofin trial. Results indicated that economic evaluation is justified whenever a more expensive treatment is expected to produce greater benefit and that economic analyses should consider quality of life and health status as well as the more easily identifiable economic outcomes.

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Comparison of the Effects of Per Case and Per Diem Based Charges on the Distribution of Hospital Costs Across Employer Groups.

Form: Journal article.

Author: Cline, K.E.

Source: *Medical Care*. 28(8):681-702, August 1990.

Abstract: Using data generated by the Experimental Hospital Case Mix Payment Program of Blue Cross of Western Pennsylvania, researchers (1) compared employer group claims based on Patient Management Categories (PMC's) (i.e., an average cost per diagnostic case) with costs based on an average cost per day and (2) identified diagnostic, group, and hospital characteristics that influence the differences in a group's costs under the case mix versus the per diem methodologies. A correlation of differences between PMC's and the diagnosis-related groups (DRG's) used by the federal government revealed a correlation coefficient of 0.98, statistically significant at the 0.0001

level. The PMC system classifies patients in up to five categories, allowing for the presence and degree of comorbidity. To compute total PMC payments for a given hospital, researchers calculated an average unit price by dividing a hospital's fiscal year 1987 projected Blue Cross inpatient expenses, excluding capital and medical education costs, by its total PMC units that were derived for Blue Cross patients. The hospital's Blue Cross capital and medical education costs were divided by its budgeted Blue Cross admissions to develop a capital and medical education cost per case. A hospital's total PMC payment is therefore the sum of its PMC unit price multiplied by its total PMC units, and its capital and medical education costs per case multiplied by its total admissions for Blue Cross patients treated by the hospital during fiscal year 1987.

Researchers simulated payments based on PMC's for approximately 200,000 inpatient Blue Cross claims submitted by 88 hospitals for the 12 month period ending June 1987, then distributed each hospital's total PMC payments to groups (1) on the basis of each group's total PMC units and its admissions and (2) on the basis of a group's total patient days. The analysis showed that changing the basis of employer group costs from the traditional per diem method to one based on diagnostic case would substantially increase the costs of many groups; 14 percent would pay at least 150 percent more (\$12 million). In a model explaining differences in employer group costs between the two payment methods (\$500,379,026 for costs based on PMC's and \$500,389,244 for costs based on adult days), patient diagnosis was found to be the major explanatory factor, contributing to two-thirds of the total explained variation. For example, for 671 groups experiencing more costs under the PMC method, costs based on PMC's exceed costs based on days by about \$7 million. Results indicated that (1) a group's total admissions, mean patient age, and gender distribution and (2) a hospital's teaching status,

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location, patient capacity, occupancy rate, and mean ancillary costs influence the differences in a group's costs under the two methods.
2 figures, 6 tables, 5 references.

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Economic Evaluation and the Rational Diffusion and Use of Health Technology.

Form: Journal article.

Author: Drummond, M.F.

Source: *Health Policy*. 7(3):309-324, June 1987.

Abstract: A researcher discusses the 1986 European Community initiative on the Methodology of Economic Appraisal of Health Technology and its objective, to establish a workshop consisting of members of collaborating centers to review the state of the art of economic appraisal of technologies as it currently exists in Europe and to recommend suitable methodologies. He addresses two issues: (1) Improving the design and conduct of economic evaluations to increase their relevance to health care decision making at the planning and clinical stages, and (2) devising policies on the diffusion and use of health technology to make fuller use of the economic evaluations that are carried out. Empirical studies support economic evaluation of expensive and nonexpensive technologies through cost benefit analysis. The major principles for economic evaluation were set out in a 10-point checklist of questions by the Department of Clinical Epidemiology and Statistics, McMaster Health Sciences Center, Ontario, Canada: (1) Was a well-defined question posed in an answerable form; (2) was a comprehensive description of the competing alternatives given (i.e., could one determine who did what to whom and how often); (3) was there evidence that the program's effectiveness had been established; (4) were all important and relevant costs and consequences

for each alternative identified; (5) were costs and consequences measured accurately in appropriate physical units prior to evaluation; (6) were costs and consequences valued credibly; (7) were costs and consequences adjusted for differential timing; (8) was an incremental analysis of costs and consequences of alternatives performed; (9) was a sensitivity analysis performed; and (10) did the presentation and discussion of the results of the study include all issues of concern to users. Researchers calculated quality-adjusted life-years (QALYs) by obtaining the utility values of health states on a scale from 0 (dead) to 1 (healthy), and then combining these utility weights with the data on the years of life gained. The cost-utility analysis, more general than the cost effectiveness analysis, can be used to evaluate health care interventions that impact on the quality of life as well as the quantity of life. Torrance and Zipursky compared cost-utility results in reported cost and adjusted cost (in 1983 U.S. dollars) per QALY for the following selected programs: (1) Phenylketonuria (PKU) screening, less than zero; (2) post-partum anti-D to Rh-negative mothers, less than zero; (3) antepartum anti-D to Rh-negative mothers, \$1,220 (1983 results); (4) coronary artery bypass surgery for left main coronary artery disease, \$3,500 and \$4,200; (5) neonatal intensive care, 1000-1499 grams, \$2,800 and \$4,500; (6) T4 (thyroid) screening, \$3,600 and \$6,300; (7) treatment of severe hypertension (diastolic greater than or equal to 105 mm Hg) in males age 40, \$4,850 and \$9,400; (8) treatment of mild hypertension (diastolic greater than or equal to 95-104 mm Hg) in males age 40, \$9,880 and \$19,100; (9) estrogen therapy for postmenopausal symptoms in women who had not had a hysterectomy, \$18,160 and \$27,000; (10) neonatal intensive care, 500-999 grams, \$19,600 and \$31,800; (11) coronary artery bypass surgery for single vessel disease with moderately severe angina, \$30,000 and \$36,300; (12) school tuberculin testing program, \$13,000 and \$43,700; (13)

continuous ambulatory peritoneal dialysis, \$35,100 and \$47,100; and (14) hospital hemodialysis, \$40,200 and \$54,000. Possible mechanisms for encouraging a rational diffusion and use of health technology are regulation by directive by central/regional government and regulation by incentive. Regulation by directive includes (1) planning of facilities, specialist departments, and specific technologies; (2) excluding technologies from public financing; (3) developing settlement policies for health manpower; and (4) strengthening pre-market controls for drugs and devices (safety, efficacy). Regulation by incentive includes (1) reforming budgetary programs within health care institutions; (2) encouraging budgetary reform within health care institutions; (3) changing payment systems for health care providers; (4) subsidizing specific technological developments; (5) charging patients; (6) encouraging competitive arrangements; and (7) developing medical audit and utilization review systems. A league table lists costs and consequences of selected medical procedures in terms of the present value of extra cost per QALY gained in British pounds: (1) Pacemaker implantation for heart block, 700; (2) hip replacement, 750; (3) valve replacements for aortic stenosis, 950; (4) coronary bypass grafting (CABG) for severe angina with left main disease, 1,040; (5) CABG for moderate angina with 3 vessel disease, 2,400; (6) kidney transplantation (cadaver), 3,000; (7) heart transplantation, 5,000; (8) home hemodialysis, 11,000; (9) CABG for mild angina with two vessel disease, 12,600; and (10) hospital hemodialysis, 14,000.

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Survey of Cost-effectiveness and Cost-benefit Analyses in Industrialized Countries.**Form:** Journal article.**Author:** Drummond, M.F.**Source:** *World Health Statistics Quarterly*. 38(4):383-401, 1985.

Abstract: This survey grouped studies under six broad headings: (1) Burden of disease and alternatives in public policy, (2) alternatives in prevention, (3) alternatives in diagnosis, (4) alternatives in therapy, (5) alternative locations of care, and (6) alternatives in health service organization. These topics are first discussed briefly, and then, using one study from each topic area, are discussed in detail. A number of studies have sought to estimate the economic burden of particular diseases on the community, with a view to informing the debate on priorities for investment in health programs. An example of such cost of illness studies is that by Cooper and Rice, who estimated the costs of a number of disease groupings in the United States in terms of the direct resource outlays for prevention, detection, and treatment, and the indirect costs or loss in output due to disability and premature death. Cooper and Rice calculated that the total cost of illness in 1972 was \$189 billion, of which \$40 billion was for diseases of the circulatory system, \$27 billion for accidents, and \$17 billion each for diseases of the digestive system and cancer. Tables present data on (1) cost effectiveness of seven programs for reducing perinatal mortality and morbidity in France; (2) cost effectiveness of programs to reduce cholesterol level in children in the United States; (3) measures of economic evaluation of neonatal intensive care, according to birthweight class in Canada; (4) alternative forms of care for the elderly in the United Kingdom; (5) weekly costs of care by dependency category in different care settings in the United Kingdom; and (6) annual total

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costs per capita for elderly populations in the United Kingdom. 1 figure, 5 tables, 73 references.

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Economic Analysis and Clinical Trials.

Form: Journal article.

Author: Drummond, M.F.; Stoddart, G.L.

Source: *Controlled Clinical Trials*.

5(2):115-128, June 1984.

Abstract: Researchers propose criteria for judging the appropriateness of including economic analysis in a given trial, suggest how that analysis could be phased in order to minimize the work involved, and discuss the wider implications for medical research of more frequent attention to economic concepts. Economic analyses should be built into clinical trials when: (1) Sizeable amounts of scarce resources are at stake; (2) responsibility is fragmented; (3) the objectives of the respective parties are at variance or unclear; (4) there exist significantly different alternatives, such as drug therapy versus surgery or hospital versus home-based care; (5) the technology underlying each alternative is well understood; and/or (6) the results of the analysis are not required before valid estimates of effectiveness are available. The kinds of indications medical researchers should use to assess whether economic analysis should be built into a given trial are: (1) Imminent resource allocation decisions, if the results of the trial are likely to be influential in deciding future patterns of care, or pressures for the adoption of the new therapy mean that this is likely to be the last trial; (2) large resource consequences, if the unit cost difference between the alternatives is suspected to be large, or the size of patient population is large; and (3) prominence of resource considerations, if questions of resource use are viewed to be important either by the clinical investigators,

the research funding body, or those who fund health care. Data requirements for economic analysis include (1) health service resource use both in the hospital and community sectors, (2) the impact of the new treatment on other community resource use, and (3) the impact of the new therapy on health status. Key points to consider when evaluating the data requirements for economic analysis are (1) performing a full economic evaluation that considers not only the costs but also the benefits of health care interventions; (2) adopting a community-wide viewpoint; and (3) ensuring that measurement of costs and benefits is not exclusively in money terms, but also in health effects or utilities. Phasing of economic analysis in the development of a new therapy should be performed in the following stages: (1) Stage one, first explanatory trials to make an estimate of the relative costs of the alternatives being compared; (2) stage two, during a selected trial, collect data, such as length of hospital stay, use of hospital resources and services, loss of productivity by patient and family, and impact on family resources; and (3) stage three, harvest the economic information relevant to the policy questions suggested by the medical results of the trial. The authors maintain that phasing in of the analysis avoids unnecessary work and that general economics capability should be built up in institutions where trials are carried out, rather than tying the employment of economists to particular trials.

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Expenditures for Reproduction-Related Health Care.

Form: Journal article.

Author: Fuchs, V.R.; Perreault, L.

Source: *Journal of the American Medical Association.* 255(1):76-81, January 1986.

Abstract: Researchers present systematic estimates of the direct money costs of reproduction-related health care in 1982: (1) Obstetrical care, (2) infant care, (3) contraception, (4) abortion, and (5) infertility services. The estimates are constructed primarily by multiplying estimated quantities by estimated prices using data drawn from sources ranging from national surveys to small clinical studies. All prices and quantities are for 1982, unless otherwise stated.

Expenditures for reproduction-related health care amounted to \$17.8 billion in 1982; this was 5.5 percent of the total health care spending of \$322 billion. The reproduction-related sector was dominated by obstetrical care and infant care, which took 46 percent and 37 percent respectively. Contraception accounted for 13 percent, while abortion and infertility services were 3 percent and 1 percent, respectively. Expenditures per woman of childbearing age were \$329.

Although only 39 percent of all women of childbearing age were in their third decade in 1982, they accounted for approximately 66 percent of all births and 55 percent of abortions. Factors influencing the proportion of future reproduction-related health care spending include (1) demographic (i.e., the aging of the baby boom generation and the smaller waves of women of childbearing age coming behind the baby boomers); (2) technologic (i.e., advances in electronic fetal monitoring and ultrasound, new fertility drugs, and improved surgical techniques affect the level of spending); (3) economic (e.g., insurance coverage changes); and (4)

sociolegal (i.e., laws governing abortion and surrogate mothering). 1 figure, 4 tables, 30 references.

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Setting Health Care Priorities in Oregon: Cost-effectiveness Meets the Rule of Rescue.

Form: Journal article.

Author: Hadorn, D.C.

Source: *Journal of the American Medical Association.* 265(17):2218-2225, May 1, 1991.

Abstract: The Oregon Health Services Commission recently completed work on its principal charge: Creation of a prioritized list of health care services, ranging from the most important to the least important. Oregon's draft priority list was criticized because it seemed to favor minor treatments over lifesaving ones. This reaction reflects a fundamental and irreconcilable conflict between cost-effectiveness analysis and the powerful human proclivity to rescue endangered life: The Rule of Rescue. Oregon's final priority list was generated without reference to costs. Therefore, the author feels it is more intuitively sensible than the initial list. However, the utility of the final list is limited by its lack of specificity with regard to conditions and treatments. An alternative approach for setting health care priorities would circumvent the Rule of Rescue by carefully defining necessary indications for treatment. Such an approach might be applied to Oregon's final list in order to achieve better specificity. 3 tables, 20 references.

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Lifetime Cost of Treating a Person With HIV.

Form: Journal article.

Author: Hellinger, F.J.

Source: *Journal of the American Medical Association*. 270(4):474-478, July 28, 1993.

Abstract: A researcher estimated the lifetime cost of medical treatment for persons with human immunodeficiency virus (HIV) from onset of infection until death, assuming that an individual is identified and treated for HIV immediately following infection. Data from interviews conducted in 1992 with 1,164 HIV-positive respondents at 26 sites in 10 cities (part of the acquired immunodeficiency syndrome (AIDS) Cost and Service Utilization Survey (ACSUS)) estimated the monthly cost of treatment for persons in four stages of HIV illness from the San Francisco Men's Health Study (all T-cell counts multiplied by 10 to the ninth power divided by L): (1) Symptomatic AIDS based on the 1987 definition, (2) HIV infection without AIDS with a T-cell count lower than 0.20, (3) HIV infection without AIDS with a T-cell count of at least 0.20 and lower than 0.50, and (4) HIV infection without AIDS with a T-cell count of 0.50 or higher. The author multiplied estimates of the monthly use of services received by respondents by the cost of each service derived from the provider survey. The products are estimates of the monthly cost of medical care incurred by patients in given stages of illness. This process was employed for all costs except prescription drugs. Since billing data from the pharmacies were generally incomplete, the costs for prescription drugs were obtained directly from the provider survey. The weekly costs for these drugs were \$63 for HIVID, \$145 for Sporanox, \$203 for Mepron, \$50 for Mycobutin, and \$183 for Marinol. Long-term care costs were estimated to be zero for persons with HIV without AIDS because only

two of the 380 persons with HIV without AIDS in the survey had spent any time in a long-term care facility. The monthly estimate for stage one is \$2,764 per person (\$1,890 for inpatient monthly costs, \$380 for outpatient visits, \$174 for home health care, \$265 for drug costs, and \$55 for long-term care). The estimate for stage two is \$990 per month (\$456 for inpatient monthly costs, \$344 for outpatient visits, \$80 for home health care, and \$110 for drug costs). The estimate for stage three is \$430 per month (\$119 for inpatient monthly costs, \$191 for outpatient visits, \$21 for home health care, and \$99 for drug costs). The estimate for stage four is \$282 per month (\$54 for inpatient monthly costs, \$151 for outpatient visits, \$10 for home health care, and \$67 for drug costs). This study projects a mean survival time of 25 months for a person with AIDS. Multiplying these figures by the average monthly cost of \$2,764 yields an estimate of \$69,100 per person for the cost of treatment from the time of AIDS diagnosis until death. Multiplying the average monthly costs by the mean monthly occupancy time in stages two through four, 12.4, 44.0, and 67.3, respectively, yields an estimate of \$50,174 for the cost of treating a person with HIV from initial infection until a diagnosis of AIDS. Adding the cost of AIDS diagnosis until death yields an estimated lifetime cost of \$119,274 for treating a person with HIV from the time of infection until death. The author asserts that the cost of treating a person with AIDS has fallen as a result of a reduction in the use of inpatient hospital services. 4 tables, 19 references.

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DRGs: Nursing Documentation Contributes to the Bottom Line.**Form:** Journal article.**Author:** Hines, G.L.**Source:** *Nursing Clinics of North America*. 23(3):579-586, September 1988.

Abstract: Nursing documentation in the medical record is an important source of information for the medical record coder. Coded data are necessary for quality assurance, risk management, and research and statistical purposes, as well as for proper Diagnosis Related Groups (DRG) assignment for third-party reimbursement. Researchers used a Medicare reimbursement rate of \$4,326 to calculate DRG payment. Facts gleaned from nursing documentation, supported by physician documentation and laboratory data, can often result in increased reimbursement for the hospital. Documentation is also important for statistical purposes, quality assurance, and risk-management monitoring. Examples of items that should be documented include (1) medication errors and drug reactions (e.g., coding for treating premature ventricular reactions due to the patient's adverse effect to a prescribed drug adds \$2,558 in reimbursement and coding for treating a patient suffering from reaction to a drug given in error adds \$5,772 in reimbursement); (2) intravenous filtration and phlebitis (e.g., not coding infiltration loses \$3,009 in reimbursement and not documenting treatment of phlebitis as a complication following surgery loses \$1,098 in reimbursement); (3) complications to treatment (e.g., not documenting hospital-acquired pneumonia loses \$1,098 in reimbursement and not documenting malnutrition as a complication to pneumonia loses \$1,687 in reimbursement); (4) respiratory distress (e.g., not coding required use of a ventilator for a patient with severe emphysema loses \$10,413 in

reimbursement); and (5) obstetrics and neonatology complications (e.g., not coding a sepsis workup and treatment for a newborn loses \$3,114 in reimbursement and not coding maternal drug use in pregnancy as part of the delivery room record loses \$1,358). DRG methodology does not adequately describe the differences in the severity of illness among the patients within the DRG; nursing documentation provides a way of grouping patients to take into account the varying amounts of nursing care required and support applications for reimbursement at a rate above the usual DRG rate.

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Cost Analysis in Family Planning: Operations Research Projects and Beyond.**Form:** Book chapter.**Author:** Kenney, G.M.; Lewis, M.A.**Source:** IN: *Operations Research: Helping Family Planning Programs Work Better*. Seidman, M.; Horn, M.C.; eds. New York, NY, Wiley-Liss, Inc., pp. 411-429, 1991.**Availability:** Wiley-Liss, Inc., 1 Wiley Drive, Somerset, NY 08873. (201) 469-4400.

Abstract: Cost Analysis in Family Planning: Operations Research Projects and Beyond addresses the relevance of cost analysis to operations research (OR) projects on family planning. The chapter (1) explains the importance of cost analysis in OR projects; (2) defines the financial, economic, and resource costs involved; and (3) describes three innovative approaches to cost analysis. With overall increases in the demand for family planning and declining government resources, cost and resource allocation have become increasingly important. Cost analysis within OR projects allows programs to maximize the impact of scarce resources and meet the increasing demand for services. However,

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while the conceptual view of cost is straightforward, the practical aspects of measuring and defining cost are often difficult and confusing. Regarding three concepts of cost analysis (economic, financial, and resource cost), complications that arise in practice include nontraceable costs, the need for quality control, the issue of measuring demand, and the importance of the scale of operation. While most cost analysis OR projects employ data from controlled experiments, such studies can have several disadvantages: They can be costly, can blur research and implementation costs, and the findings may not carry over when implemented on a large scale. Three recent methods for measuring and analyzing costs that can enhance OR projects include the multivariate analysis (hedonic), the measurement of economic costs and quality, and the cost-benefit analysis (TIPPS). The chapter concludes with seven suggested specific initiatives that would enhance and expand the scope of cost analysis in family planning and make cost-effectiveness analysis more relevant and appropriate for policy and program needs.

19 references.

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Costs and Benefits of Title XX and Title XIX Family Planning Services in Texas.

Form: Journal article.

Author: Malitz, D.

Source: *Evaluation Review*. 8(4):519-536, August 1984.

Abstract: The Texas Department of Human Resources (TDHR) provided family planning services to more than a quarter of a million women in fiscal year (FY) 1981 through its Title XX and Title XIX programs. In 1982, TDHR commissioned a study to evaluate the impact of these programs; one component was a cost-benefit analysis (CBA). Researchers

examined billing records to derive a sample population and sent survey forms to providers to determine when the patient first visited the agency, the date of her last visit in FY 1981, and methods of contraception she used before her first visit and after her last visit. Sixty-five of 78 providers returned the survey forms. The final sample included 1,606 adolescents (under age 19) and 1,605 adults (over age 20), representing about 2.5 percent and 1 percent, respectively, of the adolescent and adult Title XX populations. Researchers estimated public assistance costs for births averted and compared them with the costs of the programs to derive the cost-benefit ratio. Researchers estimated that about 56,000 unwanted pregnancies and 27,000 births were prevented by the programs, as well as 22,000 abortions and over 7,000 miscarriages. Cost savings consisted of expenditures that would have been incurred in the first year following birth in TDHR's Aid to Families with Dependent Children (AFDC), food stamp, and Medicaid programs. Total first-year savings to TDHR attributable to births averted by Title XX were nearly \$33 million (including \$11.7 million for adolescent services and \$21.5 million for adult services), or a net saving of nearly \$16 million. Cost-benefit ratios were 1:2.44 for adolescents, 1:1.73 for adults, and 1:1.93 for all Title XX patients. For Title XIX patients, the cost-benefit ratio was 1:3.04-1:3.29 for adolescents, and 1:2.93 for adults. For every dollar spent on family planning under Title XIX, the TDHR saved about \$3. Researchers calculated net savings at \$10.1 million.

4 tables, 9 references.

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**Decision Analysis for Public Health:
Principles and Illustrations.****Form:** Journal article.**Author:** McNeil, B.J.; Pauker, S.G.**Source:** *Annual Review of Public Health*.
5:135-161, 1984.

Abstract: Researchers present some of the basic principles that underlie decision analysis and their application to public health issues. A decision analysis consists of five steps: (1) Structuring the problem so that alternative courses are defined, (2) estimating the probability of each chance outcome, (3) assigning a relative value or utility to each potential outcome, (4) calculating the best alternative using the principle of expectation to average out and fold back the decision tree model, and (5) performing a set of sensitivity analyses wherein different assumptions are varied to determine the robustness of the conclusions. The techniques of decision analysis include (1) building trees, (2) Bayesian probability revision, (3) receiver operating characteristic (ROC) analyses, (4) utilities, (5) sensitivity analyses, and (6) costs. The decision tree is the notation used to represent the model, with events separated into those requiring a choice and those occurring by chance. Bayesian probability revision relates to diagnostic sensitivity and specificity. The ROC curve and the mathematics of optimization are used to produce more reliable results. Utilities are outcomes on decision trees and can be assessed using hypothetical lotteries, or binary scales to calculate the expected utility of the gamble. Sensitivity analyses examine the effects of changes in single or multiple parameters, holding other parameters constant. The repeated sensitivity iterations test the robustness of the conclusions and specify the optimal strategies for combinations of assumptions. Costs, whether direct, indirect, or induced, are accounted for

using present and future values of money and discounted to reflect a real monetary growth rate. Cost-benefit analyses evaluate strategies by the difference between dollars expended and dollars saved. Cost-effectiveness analyses are defined on a single scale. The differences in expected costs and expected effectiveness are calculated as a marginal cost-effectiveness ratio. Among secondary causes for hypertension, renovascular disease (RVD) is most common, with a prevalence of 4.5 percent. In considering RVD screening of the hypertensive population, there are two strategies. In strategy one, all patients are screened for RVD with an intravenous pyelogram (IVP) and, if this is abnormal, further examinations are performed. Surgery is then performed on all patients with confirmed fibromuscular disease (FM) and to those with arteriosclerotic disease (AS) who are considered operable. The balance with AS are treated medically. In strategy two, no one is screened. Researchers found that in patients with FM surgery the net change in quality-adjusted life expectancy per surgical cure in years discounted at 5 percent per annum at age 30 is -0.23 years among males, -0.45 years among females and at age 50 is -0.62 years and -0.43 years, respectively. The net increase in cost per surgical cure in patients with FM surgery at age 30 is \$13,000 among males, \$9,000 among females and at age 50 is \$30,400 and \$13,400, respectively. Researchers found that in patients with FM and AS surgery the net change in quality-adjusted life expectancy per surgical cure at age 30 is -1.39 among males, -0.99 among females and at age 50 is -1.83 and -1.49, respectively. The net increase in cost per surgical cure in patients with FM and AS surgery at age 30 is \$10,600 among males, \$8,800 among females and at age 50 is \$12,800 and \$10,900, respectively. In the case of lead screening programs for children, a decision analysis compared three strategies: (1) Free erythrocyte protoporphyrin essay

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(FEP), (2) blood lead screening, and (3) no screening. The marginal cost effectiveness ratios compared FEP screening versus no screening, blood lead screening versus no screening, and blood lead screening versus FEP screening. Dollar costs per case of learning disability averted were \$220 for FEP screening versus no screening, \$3,370 for blood lead screening versus no screening, and \$20,940 for blood lead screening versus FEP screening. Dollar costs per case of mental retardation averted were \$1,500 for FEP screening versus no screening, \$26,300 for blood lead screening versus no screening, and \$2,010,000 for blood lead screening versus FEP screening. An example of decision analytic techniques in immunization practices is the swine flu program for a general population. Vaccine efficacy impacts on costs by its reaction rates and its ability to immunize against swine flu; the larger the percentage of individuals accepting the vaccine, the greater its net effects. A Delphi analysis indicated that a likely acceptance rate was 67 percent for members of the general population and 59 percent among high risk individuals and that the probability of an epidemic was 0.10. If the vaccine was offered in public programs at an estimated administration cost of \$0.50 per person in the target group, the break even acceptance rates for programs in which the vaccine was offered to the general population 5 years of age and over, 25 years and over, and just the high-risk group were 53 percent, 37 percent and 24 percent, respectively.

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Determining Optimal Screening Policies Using Decision Trees and Spreadsheets.

Form: Journal article.

Author: Milsum, J.H.

Source: *Computers in Biology and Medicine*. 19(4):231-243, 1989.

Abstract: A researcher describes the optimal screening policies for specific disease or high-risk conditions in order to minimize overall expected cost or disutility function. The author states that if an inexpensive prescreening is available, by using some readily available criterion or marker, then the full screening process could be restricted to a high-risk group. The model includes decision trees set up for VP PLANNER, LOTUS 123, or compatible software based on the probabilities and costs of all possible outcomes. Variables and parameters include (1) the prevalence of the condition in the population; (2) the proportion of the population to be screened; (3) the sensitivity of the screening test, assumed to be 0.95; (4) the specificity of the screening test, assumed to be 0.80; (5) the true or false positives or negatives respectively resulting from screening with the given sensitivity and specificity; (6) the prevalence in the high-risk screened group; and (7) the prevalence in the unscreened group. The author has assigned the following costs for each of the screening outcomes: (1) True positive, 100 units; (2) true negative, 0 units; (3) false positive, 50 units; and (4) false negative, 1,000 units. If the costs range from 30 to 45 units per person, then the per capita cost of the screening can be expected to decrease as the screening population increases. The cost ratio (cost for whole population screened by the cost of true positive) is 0.3. In the decision tree model formulation, when the prevalence of the condition in the population is 10 percent, the screened population is 65 percent with a per capita cost

of 33.96 and a prevalence of 0.142; the not screened population is 35 percent with a per capita cost of 0 and a prevalence of 0.024. For the screened population, the true positive cost is 11.77, the true negative is 15.15, false positive is 9.36, and false negative is 4.78. The total cost for a true positive is 26.92 and for a true negative is 22.64. For the not screened population, the positive cost is 8.49 and the negative cost is 0. The total cost for a positive is 25.05 and for a negative is 24.51; total screening cost is 49.56. In the decision tree model formulation when the prevalence of the condition in the population is 5 percent, the screened population is 35 percent with a per capita cost of 38.30 and a prevalence of 0.109; the not screened population is 65 percent with a per capita cost of 0 and a prevalence of 0.022. For the screened population, the true positive cost is 5.01, the true negative is 9.55, false positive is 5.51, and false negative is 1.98. The total cost for a true positive is 14.57 and for a true negative is 22.08. For the not screened population, the positive cost is 14.59 and the negative cost is 0. The total cost for a positive is 21.59 and for a negative is 15.06; total screening cost is 36.65. In the decision tree with 5 percent prevalence, the cost of false conditions rises relative to the cost of true conditions. Overall per capita cost falls because the true cases were reduced by one-half, but the cost per case is almost 50 percent higher than with 10 percent prevalence, 733 (20 x 36.65) versus 497 (10 x 49.7), which is due mostly to the identification problem with the lower prevalence. Determination of the proportion of population to be screened minimizes overall costs. The model includes computations of the prevalences in the screened and nonscreened sub-populations for different levels of screening. The microcomputers afford instantaneous complex calculations and sensitivity studies. The generalized implementation on a microcomputer spreadsheet provides a user-friendly format for

sensitivity and optimization processes across different parameter conditions.

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Ante-natal Screening: What Constitutes Benefit?

Form: Journal article.

Author: Mooney, G.; Lange, M.

Source: *Social Science and Medicine*. 37(7):873-878, 1993.

Abstract: Researchers discussed the application of economic appraisal in prenatal screening. In particular, they examined the way in which economists to date have attempted to measure and value the benefits of prenatal screening. They argued that there are problems with existing approaches particularly in terms of the nature of women's utility functions and which arguments are present in these utility functions. They suggested that policy makers are unlikely to take full account of the results of such analyses until economists better attempt to reflect measures of what women want from prenatal screening. Three separate but related approaches to the assessment of the benefits of prenatal screening programs are found in the economic appraisal literature: (1) The resource savings method, (2) the excess costs method, and (3) the replacement method. The resource savings method assumes that there is no replacement of any aborted fetus. Therefore, the average family size for any woman is reduced by exactly one as a result of the existence of a screening test which reveals an affected fetus which she chooses to abort. The excess costs method assumes that there is instantaneous replacement of the affected fetus by a normal fetus of the same gestational age. In this case, family size is not affected. The replacement method assumes that there is a delay in possible replacement to allow for the normal biological processes to occur. It also accepts

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in principle replacement rates of anything from 0 percent to above 100 percent. The logic of the over 100 percent figure is that in a world with an effective diagnostic test for, say, Down's Syndrome, women may choose to conceive and give birth when otherwise they would not. 1 table, 22 references.

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Cost-Effectiveness Analysis in Pediatric Practice.

Form: Journal article.

Author: Pantell, R.H.; Berwick, D.M.

Source: *Pediatrics*. 85(3):361-364, March 1990.

Abstract: Two physicians present a commentary on how physicians decide to balance their responsibilities to an individual patient with their social responsibility. They examine the analytical methods used by Lieu et al., which provide an example of decision analysis applied to a common pediatric problem. The steps used by Lieu et al. to create the analysis include: (1) What alternatives are considered in the decision tree?; (2) what probabilities do the authors use?; (3) which outcomes are included and which are not?; (4) what costs are included and how are they assessed?; and (5) is sensitivity analysis thorough? All decision analyses are arbitrarily bounded by the selection of some initial set of options. Lieu et al. consider four different clinical outcomes: (1) Rheumatic fever, (2) rheumatic heart disease, (3) suppurative complications of pharyngitis, and (4) allergic reactions to penicillin. However, they omit an infinite number of other possible strategies. When decision analysis enters the terrain of cost-effectiveness analysis, as in the article by Lieu et al., choices are made about how to assess dollar costs and benefits. In Lieu et al.'s article, direct medical costs are included, but

indirect costs such as patient time, work lost, and some forms of institutional overhead are not. These choices are subtle and important and become even more complex when one attempts to move from medical charges, which may not reflect true costs, to more accurate cost estimates. Because decision analyses depend on many estimates that do not have firm bases, it is customary to repeat the calculations of cost, risk, and benefit many times, letting the uncertain variables change through their range of uncertainty. This procedure is called sensitivity analysis, because it allows one to explore the sensitivity of the preferred choice within the range of current uncertainty. Decision analysis is a tool to support decision, not a replacement for judgment. In the Lieu et al. article, it is the authors' best guess that their preferred strategy, antigen test alone, can prevent rheumatic fever at a cost of \$52,208 per case prevented and severe rheumatic heart disease at more than \$1 million per case prevented. The wisdom of these investments in prevention is an issue that goes far beyond formal analytic techniques. 13 references.

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Cost-Benefit Analysis of the Policy of Prevention of Preterm Delivery.

Form: Book chapter.

Author: Papiernik, E.; Bretz, H.

Source: IN: *Effective Prevention of Preterm Birth: The French Experience Measured at Haguenau*. Papiernik, E.; Keith, L.G.; Bouyer, J.; Dreyfus, J.; Lazar, P., eds. White Plains, NY, March of Dimes Birth Defects Foundation, pp. 207-214, 1989.

Availability: March of Dimes Birth Defects Foundation, 1275 Mamaroneck Avenue, White Plains, NY 10605.

Abstract: Cost-Benefit Analysis of the Policy of Prevention of Preterm Delivery, a book

chapter, relates details of a study occurring between 1971 and 1982 that measured the additional costs and specific benefits resulting from a preterm birth policy in France. Researchers at first did not include normal costs associated with pregnancy and prenatal care, but included costs and benefits resulting from the changes in the number of prenatal consultations (100 French francs (F) per consultation), work leaves (80 F per day), hospitalizations (1,000 F per day), and newborn babies transferred to a pediatric department or neonatal resuscitation unit (2,320 F per day). Eventually all consultations, additional work leaves, and hospitalizations in the first two trimesters were considered as a cost attributable to the preterm delivery prevention program even though this method overestimated the true cost (figures for true cost were not stated). Investigators also made similar choices in measuring intervention benefits. The average number of prenatal consultations increased dramatically, from 1.9 in 1971 to 5.9 in 1982, and the frequency of work leaves prior to legally mandated pregnancy leave increased from 24 percent to 48 percent. Based on 1982 francs and a fee of 100 F per consultation, the additional charge for four consultations per 1,000 pregnancies was 400,000 F. The prevention cost for 1,000 births was 1,467,000 F. The savings from the reduction in the number of neonatal hospitalizations was 903,430 F. This meant that the immediate benefit in avoided hospitalizations covered two-thirds of the prevention cost. An estimated 240 life years without handicap per 1,000 births were gained. The monetary value for each year of life without handicap gained by the program comes to 543,370 F divided by 240, or 2,265 F. 3 tables.

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Utility-Based Model for Comparing the Cost-effectiveness of Diagnostic Studies.

Form: Journal article.

Author: Patton, D.D.; Woolfenden, J.M.

Source: *Investigative Radiology*.

24(4):263-271, April 1989.

Abstract: Researchers evaluate cost-effectiveness models for the detection task of diagnostic testing and suggest a utility-based model for comparing the relative cost-effectiveness of diagnostic procedures for both the individual patient who is to have diagnostic testing and a population for which policy decisions regarding diagnostic testing have to be made. The expected direct cost (EDC) equals the base cost of the test plus the expected cost of morbidity and mortality. The effective cost (EC) of a diagnostic test is the money spent per unit of diagnostic performance. The unit of diagnostic performance can be measured as diagnostic utility (DU), or expected utility, the probability-weighted sum of the utilities of the four test outcomes, true positive (TP), true negative (TN), false positive (FP), and false negative (FN): $DU = U(TP)P(TP) + U(TN)P(TN) + U(FP)P(FP) + U(FN)P(FN)$. The utility is a relative measure taking on values between negative 1 (worst possible outcome) and positive 1 (best possible outcome). DU incorporates the clinical decision analytic variables sensitivity (Se), specificity (Sp), equivocal fraction (EF), disease probability (P(D)), and outcome utility (U). DU is not an inherent property of a diagnostic test but of test-observer interactions in a clinical setting. The model sets the effective cost (EC) of a diagnostic test equals actual direct cost (ADC)/DU. When DU equals 1 (perfect test) EC equals ADC and the patient benefits from the test dollar for dollar. When DU is less than 1, EC exceeds ADC. If DU approaches zero, EC becomes infinite and

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the test has no effectiveness at any cost. DU depends strongly on P(D). If Se and Sp differ significantly, then EC also depends on P(D), and the effective cost of a test performed in the wrong P(D) setting may be several times its actual direct cost. The authors use two studies to illustrate use of the model: (1) Snow et al. and (2) Alderson et al. which compare three tests for detecting metastatic disease in the liver; a radionuclide liver scan, a computed tomography (CT) study, and an ultrasound study. They calculated expected direct costs and diagnostic utility using 1983 base costs (CT \$475, ultrasound \$150, liver scan \$300). For an estimated mean associated cost of \$200 and a mortality cost of \$200,000, the expected direct cost of the CT scan is \$451.21 for no mortality and no morbidity; \$33.74 for morbidity with no mortality; \$0.89 for morbidity with mortality; and \$17.84 for mortality. The outcome costs equal \$503.68. The morbidity and mortality costs in this case added 6 percent to the base price. Based on total calculations, the data from Snow et al. indicate that group CT had the highest diagnostic utility and ultrasound had the lowest over all ranges of P(D). Taking into account all costs, CT would have the lowest effective cost of all three tests at low P(D), liver scanning the lowest at midrange, and ultrasound the lowest at high P(D) (confirming test). The high base cost of CT scanning was counterbalanced by its high performance, the low performance of ultrasound by its low base cost. The model requires the user to insert his or her own sensitivity and specificity values since the values differ from institution to institution. When the data allows, the authors suggest using a receiver operating characteristic (ROC) curve for diagnostic tests to obtain the optimum operating point. This model of comparing effective costs compares actual direct cost with clinical measures of test performance and utility values that allow expression of patient/doctor fears and preferences.

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Time Preference in Medical Decision Making and Cost-Effectiveness Analysis.

Form: Journal article.

Author: Redelmeier, D.A.; Heller, D.N.

Source: *Medical Decision Making*.

13(3):212-217, July-September 1993.

Abstract: Researchers measured the time preferences held by individuals toward hypothetical health states, determined their implicit discount rates, and tested whether individuals' implicit discount rates conformed to the assumptions of the standard medical economic model of time preference. Subjects included a random sample of 121 medical students, house officers, and attending physicians. The participants were contacted by telephone and scheduled for a face-to-face interview and questionnaire (80 percent response rate). The questionnaire contained detailed descriptions of three hypothetical but realistic medical scenarios. The first scenario described a strangulated internal hernia, having a colostomy for 4 months, and subsequent intestinal reattachment with colostomy closure. The second scenario described herpetic keratitis that caused 4 months of painless bilateral blindness but no scarring or residual complications. The third scenario described an episode of psychiatric depression that resolved after four months on medication. Participants imagined that each event was destined to occur at five sequentially different times in the future: 1 day, 6 months, 1 year, 5 years, and 10 years, or 15 distinct prospects.

Researchers measured the disutility of each prospect using two utility-elicitation techniques: (1) Standard gamble, and (2) categorical scaling. The standard gamble required the respondent to indicate his or her indifference probability relative to a gamble between the event's occurring immediately and the event's being prevented altogether. The categorical-scaling technique required the

respondent to indicate how bad a given prospect was using a scale of 0 to 100, where 0 represented the worst news and 100 represented the best. Discount rates were estimated for each scenario separately for each of the elicitation techniques. The final sample of 1,394 implicit discount rates provided the data for analyses in the exponential discount model. To determine whether discount rates were constant over time, investigators used the paired t-test to evaluate proximal and distal discount rates. They also used a paired t-test to compare implicit discount rates for the elicitation techniques. Of all the discount rates, 62.1 percent equalled zero, 10 percent were less than 0, and 15.7 percent were greater than 0.10. Mean discount rates for relatively proximal time intervals tended to be larger than those for relatively more distant intervals (0.041 versus 0.025, p less than 0.01). Mean discount rates for blindness tended to be smaller than those for colostomy or depression (0.023 versus 0.039 versus 0.037, respectively, p less than 0.005). Hence, respondents' implicit discount rates are not always small positive numbers that are constant over time and the same for all settings. The authors suggest that the conventional exponential discount model may not fully characterize the time preferences held by individuals.

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Issues in the Design of Future Preventive Medicine Studies.

Form: Journal article.

Author: Russell, L.B.

Source: *Ciba Foundation Symposium.*

110:203-217, 1985.

Abstract: A researcher discusses the design aspects of cost effectiveness analysis of preventive care advances and its evolution from an application of economic reasoning to

an accepted aid in decision making. The design aspects reviewed include (1) the issues of the perspective of the study, (2) the choice of discount rate, (3) medical costs in added years of life, (4) measurement of the costs of institutionalization, (5) measures of health effects that reflect changes in the quality as well as the quantity of life, and (6) the proper place of estimates of earnings. The Weinstein and Stadon (1977) cost effective formula included an analysis of prevention where costs equal the medical costs of the preventive measure; minus savings in acute medical care, rehabilitation, and long-term institutional care; plus costs of treating side effects of the preventive measure; plus costs of ordinary medical care during added years of life. In this formula, the effects equal the lives or years of life saved by prevention minus lives or years lost to side effects. The effects reflect gains and losses in quality of life as a result of prevention expressed in terms of an equivalent number of years of healthy life. The costs and effects are discounted, summed, and expressed in the form of a cost-effectiveness ratio. The author suggests (1) that the social perspective is preferable because it does not represent any group's point of view, no other perspective is predominant, and all costs and effects are included; (2) that all studies use 5 percent as the discount rate; (3) that the formula be calculated both ways by excluding and calculating medical costs in added years of life; (4) that the relevant costs of institutionalization are over and above the costs if the same person lived a normal life; (5) adoption of the quality-adjusted life year as the standard for measuring health effects; and (6) including earnings when the consequences of a program can be measured in dollars, to represent detail and amplification of health effects, and excluding earnings when they result in double-counting health effects. Other issues that affect the comparability of studies include: (1) Value on patients' time, which is often excluded; (2) the assumption that not all

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patients comply with the prescribed regimen in a prevention program, while studies of acute care generally assume full compliance; and (3) point estimates that are not comparable estimates of precision, or uncertainty. The author suggests that (1) probability distributions be assigned to each of the important parameters in a study, (2) a probability distribution or standard error be generated empirically for the cost-effectiveness ratio, and (3) cost effectiveness studies be more consistent in approach and more standardized in assumptions so that valid comparisons can be made.

452

Framework of a Protocol for the Evaluation of Prenatal Screening Procedures: Economic Aspects.

Form: Journal article.

Author: Rutten, F.

Source: *European Journal of Obstetrics, Gynecology and Reproductive Biology.*
28(Supplement):69-77, 1988.

Abstract: Guidelines are presented for the economic evaluation of prenatal screening procedures. The topics addressed include (1) the meaning of economic evaluation, (2) the determination of priorities in evaluative research, (3) the relative range of alternatives, (4) the selection of the type of analysis, (5) the measurement of costs and benefits, (6) the assessment of costs and benefits, (7) uncertainty, and (8) presentation of the results. Economic evaluation can be defined as the comparative analysis of alternative courses of action in terms of both their costs and consequences. One can establish priorities by performing a global cost-effectiveness analysis for each prenatal screening procedure under consideration. Economic evaluation should include a thorough comparison of competing alternatives. Types of analysis include cost

analysis of a new procedure compared to existing procedures, and cost per quality adjusted life year. A societal viewpoint is important when considering the relevant range of costs and benefits; all relevant costs and benefits of the procedure should be considered in the analysis. Sources and methods of valuation of costs and benefits should be clearly stated. Costs are normally valued in units of local currency, based on prevailing prices of personnel, commodities, and services. All current and future program costs are normally valued in constant dollars of some base year. In the absence of reliable medical evidence for some technologies, economists have applied sensitivity analysis to a number of medical parameters. It is important that results be presented in a way that helps a decision maker appreciate their relevance to his or her circumstances. It is also important to (1) identify differences between locations, (2) identify key value judgments clearly in presentations, and (3) recognize that there are other relevant factors in decision making, such as equity in the provision of services. 2 tables, 10 references.

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Explaining Resource Consumption Among Non-normal Neonates.

Form: Journal article.

Author: Schwartz, R.M.; Michelman, T.; Pezzullo, J.; Phibbs, C.S.

Source: *Health Care Financing Review.*
13(2):19-28, Winter 1991.

Abstract: The adoption by Medicare in 1983 of prospective payment using diagnosis-related groups (DRG's) has stimulated research to develop case-mix grouping schemes that more accurately predict resource consumption by patients. Researchers compared the DRG and pediatric modified diagnosis-related groups (PMDRG's), presenting a new method

designed to improve case-mix classification for newborns through the use of birthweight in combination with DRG's to adjust the unexplained case-mix severity. Investigators added a continuous birthweight function to the current DRG's for sick newborns, allowing full exploitation of the strong correlation between birthweight and resource consumption by newborns. They used regression analysis to compare the predictive power of the models. Analytic models examined cell size and explanatory power of the DRG's, the PMDRG's, and the simplified grouping scheme (BWDIS) developed by the authors which uses birthweight and discharge status only. By dividing cases into more and more refined categories, one can classify nonnormal neonates into case-mix groups that are homogeneous across groups of hospitals. However, there is a tradeoff between greater explained variation and large numbers of small cells. BWDIS model regressions reveal that the current DRG's can be easily improved without using any diagnostic information. The use of the birthweight function as a DRG adjuster is one improvement that would not require additional groups, and it is objective. The use of a continuous birthweight adjustment for DRG's to better reflect case mix will allow the current payment method to more accurately reflect severity and thereby pay for care more precisely. 3 figures, 7 tables, 14 references.

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Economic Evaluation of Neonatal Intensive Care: Which Variables Have to be Known?**Form:** Journal article.**Author:** Sinclair, J.C.**Source:** *International Journal of Technology Assessment in Health Care*.
7(Supplement 1):146-150, 1991.

Abstract: The author discusses health care evaluation in economic terms and stresses that this type of evaluation is fundamentally an exercise about opportunity costs. Meta-analysis demonstrated that the elements of an economic evaluation include (1) a well-defined question posed in answerable form, specifying the alternatives for each comparison; (2) a specific description of the competing alternatives; (3) prior or simultaneous evidence of the program's effectiveness; (4) identification of the important and relevant costs and consequences for each alternative; (5) accurate measurement of the costs and consequences; (6) credible valuation of the costs and consequences; (7) adjustment of the costs and consequences for differential timing; (8) an incremental analysis of costs and consequences of alternatives; and (9) a sensitivity analysis. The evaluator's viewpoint will affect the relevancy of different cost categories such as operating costs, and consequences such as effects, utilities, and benefits. Most analyses can be classified into five types of data analysis: (1) Cost analysis, (2) cost minimization, (3) cost-effectiveness, (4) cost-utility, and (5) cost-benefit. 2 tables, 49 references.

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Evaluating Population Programs: International Experience With Cost-Effectiveness Analysis and Cost-Benefit Analysis.

Form: Monograph.

Author: Sirageldin, I.; Salkever, D.; Osborn, R.; Cebula, D.; Evenchik, A.; Lewin, N.; Mandel, P.; eds.

Source: New York, NY, St. Martin's Press, Inc., 534 p., 1983.

Availability: St. Martin's Press, Inc., 175 Fifth Avenue, New York, NY 10010. (800) 221-7945.

Abstract: Evaluating Population Programs: International Experience With Cost-Effectiveness Analysis and Cost-Benefit Analysis examines cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) of the planning and evaluation of population and policy programs, particularly in Africa, Asia, and Latin America. Intended for population and health program managers, planners, policy makers, and social scientists working in the field of population planning programs, the papers in this book were written by participants in the International Workshop on Cost-Effectiveness and Cost-Benefit Analysis of Population Planning Programs, which met in August 1981. The volume has two parts, the first of which covers methodological and conceptual issues such as CBA/CEA techniques and their applications to manpower and population policies. Contents of the first part include the main workshop background paper; an overview of the literature of cost-effectiveness as applied to family planning programs; and other papers focusing on a methodological or conceptual issue in the application of CBA/CEA to population activities. The second part examines the application of CBA/CEA to family planning programs. Presented are empirical findings from 12 case studies in 9 countries (2 African,

2 Asian, and 5 Latin American). The problems of program application included issues of measurement, cost estimation, and standardization of output measures. The book includes numerous tables and figures; references follow some chapters, and there are four appendixes.

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Oregon Formula: Health Economists' Dream or Stalinist Nightmare?

Form: Journal article.

Author: Stevenson, R.

Source: *Archives of Disease in Childhood*. 66(8):990-993, August 1991.

Abstract: Under new arrangements for the British National Health Service (NHS), purchasers of health care must make contracts with health care providers. That process will make explicit choices about whether to treat or not to treat a condition. The Oregon formula, the only comprehensive system for making such decisions, relates the cost of a medical intervention to its benefits, measured in quality-adjusted life years (QALY) gained. Treatments are ranked according to the cost of producing one QALY; the intention is to first purchase the cheapest QALY's, then the second cheapest, and so on until the budget is exhausted. Procedures ranked below a cut-off point will not be offered. Cost utility analysis has much in common with cost effectiveness analysis (which seeks to find the method of least cost for achieving a well-defined objective), but focuses directly on the welfare of the patient by seeking alternative means of producing QALY's. The Oregon system has addressed the problem of scarce resources by disallowing treatment for some conditions (e.g., treatments for infertility and neonatal care for very-low-birthweight infants). Pediatric interventions rate highly in cost per QALY ranking in many respects, and there are

many areas where cost utility analysis in pediatrics is unique because the infants cannot make their own decisions. In pediatrics, the decision to treat or not to treat can have profound financial and nonfinancial implications for parents and siblings as well as for the health services. The author notes two objections to a priority system based on QALY's: (1) It does not adhere to principles of equity within the NHS, and (2) the Oregon system is vulnerable on operational grounds. There is no consensus on how valuations of health should be made and whose opinions to take into account. (The Oregon Health Commission used telephone interviews to sample public opinion on valuations of health.) A fully operational scheme requires the evaluation of (1) all medical therapies; (2) a large number of inputs to those treatments; (3) choices between preventive and curative medicine; (4) hospital, community and alternative location care; and (5) changes in costs and technology. To meet these data requirements even partially would require a huge (and costly) input from clinicians, economists, accountants, and other health care workers. Estimates of the costs of QALY's gained are averages derived from statistical samples of patients, but averages may not be a good guide to the cost of gaining a QALY for particular patients. One great concern is that a rigid system of priorities, based on highly imperfect estimates of the cost of gaining a QALY, could negate clinical freedom to pursue the best interests of individual patients. A full-scale NHS implementation of the Oregon approach seems premature in the present state of the art of health care evaluation. 11 references.

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Selective Screening: When Should Screening Be Limited to High-risk Individuals?**Form:** Journal article.**Author:** Szklo, M.**Source:** *Journal of General Internal Medicine*. 5(5, Supplement):S47-S49, September-October 1990.

Abstract: A researcher evaluated whether screening to detect early disease should be limited to screening of high-risk subjects, a selective screening. He suggests that for a selective screening program to be successful, the screening test should have a high level of accuracy, in addition to accurate discrimination of who is at high risk. Identification of high-risk subjects is done for the purpose of carrying out secondary prevention, not to detect risk factors causally related to the disease. He proposes that, unlike primary prevention, the purpose of screening for early disease detection is not to modify the risk factors, but to identify and treat individuals with subclinical disease. The author uses a hypothetical population of 2,000 individuals uniformly distributed in terms of presence or absence of two risk factors that has a total of 240 prevalent cases. Prevalence rates are given for each stratum formed on the basis of combinations of the two risk factors. The prevalence rate ratio for each risk factor is 3.0. Three options are available: (1) Screen all subjects in the population, (2) screen subjects who are positive for only one of the risk factors, or (3) screen subjects who are positive for both risk factors. For all options, it is assumed that the same test is being used and that its sensitivity and specificity are both 90 percent. The sensitivity allows identification of 90 percent of all the cases, or 216 out of the 240; however, the false-positive rate is fairly high, since 176 (45 percent) of the 392 test positives are not true cases. If the

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initial screening examination costs \$200, the cost per true case found in the entire population is approximately \$1,850. Another strategy is to screen only those individuals who are positive for one of the risk factors.

Screening for only one risk factor reduces the population to be screened and the sensitivity of the test (from 90 percent to 60 percent), but the specificity increases for the more selective group and the false positive rate is lower. On the other hand, the false-positive rate also decreases when only high-risk groups are screened and as a consequence, there is a reduction in cost per true case found by a selective, compared with a nonselective screening program. If the initial screening examination costs \$200, the cost per true case found in when only one risk factor is present is approximately \$1,390 and when both risk factors are present is \$1,110. Even if risk factors are independent and do not interact with each other, when the high risk group is defined by a combination of risk factors, rather than by only one risk factor, program sensitivity decreases further, although the false-positive rate and the cost of the program also decrease. Therefore, program sensitivity in selective screening can be low even when conditions are favorable, with a high disease prevalence and a strong interaction between risk factors. The distinction between test accuracy and program accuracy presented in the context of impact on cost/true cost detection, reflects the gain in specificity and loss in sensitivity for the total target population. When two or more risk factors are combined to define high-risk subjects, a gain in program accuracy and a relative reduction in cost/true case found develop if there is additive interaction between these risk factors. Although periodicity of screening is hard to determine, it is a function of several factors, including (1) the duration of the detectable preclinical interval preceding the critical point (the point in time beyond which screening is less effective or ineffective), (2)

the accuracy of the screening examination, (3) the severity of the disease, and (4) the risks and costs associated with the screening procedures. The author suggests that risk factors that predict disease incidence should not also be used as a criterion for periodicity of screening and that if the durations of the detectable preclinical intervals preceding the critical point are the same for low-risk and high-risk subjects, there is no reason the second screening examination should be offered after a longer period in low-risk, compared with high-risk subjects. The screening will capture only cases that have a long detectable preclinical phase, which may have a better outlook regardless of screening. Selective screening for secondary prevention is a function of current epidemiologic knowledge of risk factors for disease occurrence, which determines the quality of criteria to classify subjects into high-risk or low-risk subsets of the target population.

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Modeling the Cost and Performance of Early Identification Protocols.

Form: Journal article.

Author: Turner, R.G.

Source: *Journal of the American Academy of Audiology.* 2(3):195-205, July 1991.

Abstract: A researcher presents a simple model that permits the calculation of the performance and cost of early identification protocols regarding hearing loss. The author asserts that the model is sufficiently general to accommodate most early identification strategies including those that meet the goal of identification and habilitation by age 6 months. The model measures protocol performance using hit rate, false alarm rate, and selected posterior probabilities. It calculates two measures of the financial cost: One measure reflects the cost of implementing the protocol,

the other reflects the cost effectiveness of the protocol. The parameters required by the model are based on published clinical data and include disease prevalence, hit rate/false alarm rate of the individual tests in the protocol, and test correlation. Because the model has the ability to compare different early identification protocols on the basis of cost and performance, the model helps audiologists design and select early identification protocols that are optimal for their particular clinical situation. The author concludes that the model generates a quality and quantity of information not available elsewhere. This information can be combined with other important factors, not considered in the model, to produce a reasonable, defensible cost-benefit analysis.

3 figures, 1 table, 33 references.

459

Principles of Cost-effective Resource Allocation in Health Care Organizations.

Form: Journal article.

Author: Weinstein, M.C.

Source: *International Journal of Technology Assessment in Health Care.* 6(1):93-103, 1990.

Abstract: A researcher examines the applicability of the cost-effectiveness framework to resource allocation in health care organizations. The general cost-effectiveness model is applicable when the following conditions are met: (1) A well-defined measure of effectiveness or program performance; (2) a specified resource constraint; and (3) a set of programs from which to choose, each of which produces some quantity of effectiveness and consumes some of the constrained resource. The author discusses the societal perspective of cost-effectiveness analysis, where the constrained resource is the total economic output of the society, i.e., its net burden on the gross national product (GNP). The components of

net economic costs in a societal cost-effectiveness analysis are (1) direct health care costs (or savings), (2) direct personal costs (or savings), (3) direct nonhealth costs (or savings), and (4) indirect costs (or savings). Direct health care costs (or savings) include costs directly related to the program or technology, costs (or savings) of tests and treatments induced (or averted) as a result of clinical information obtained, costs required to treat side effects and complications, savings because of avoidance and subsequent morbidity, and costs of treating conditions during added years of life. Direct personal costs (or savings) include transportation, home care services, equipment and supplies used in the home, and special foods. Direct nonhealth costs (or savings) include property damage or loss, crime and criminal justice costs, and special education costs. Indirect costs (or savings) include productivity gains or losses and opportunity cost of time spent by patients (e.g., travel, waiting for providers, hospitalization). Costs and health consequences that occur over time should be discounted to present value and projected to future value. The most important difference between the societal perspective and the limited health care sector is that costs and savings not affecting the use of health care resources are not included in the numerator of the C/E ratio; nonhealth direct costs and indirect costs and savings do not affect the measure of cost from this perspective. The difference in interpretation of the government's interest versus the societal interest is that health care costs not financed from public funds would be excluded, as would direct personal costs. The taxable portion of indirect costs and savings (earnings) and nonhealth costs that are publicly financed (e.g., special education, disability) would be included. In a government agency program, such as Medicare, the cost of a technology or program is its effect on the agency's budget. Costs not covered by the agency's jurisdiction, personal

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costs, indirect costs and savings, and nonhealth costs falling outside the agency's jurisdiction would be excluded. In a managed care setting, if the revenues are regarded as fixed, costs and savings are those related to health care services provided to members. Implied resource constraint means that net income in the long run must be positive, after considering the opportunity cost of investment. Resource allocation decisions in hospitals relate to the mix of primary services offered, to the content of care within an admission, and to the acquisition of technologies for clinical use. Consumer-based decisions about health insurance, utilization of services paid partly or fully out of pocket (because of deductibles, copayments, or exclusions) and personal health practices (diet, exercise, random monitoring, self-help groups) must be made within the limits of personal resources. T.H. Lee et al. analyzed screening strategies for left-main coronary artery disease. They calculated the cost and effectiveness of five alternative strategies: Observe only, three strategies involving exercise electrocardiography but differing according to the criterion for proceeding to angioplasty (ST-segment depression greater than 3 mm, 2 mm, or 1 mm, respectively), and angioplasty for all patients. Costs included the cost of screening, the expected cost of angioplasty, and the cost of coronary artery bypass surgery for patients found to have left-main coronary artery disease. Effectiveness was measured in years of life gained, attributable to the benefit of the surgery. In 40 year olds, the strategy of screening with a 3 mm threshold for angiography resulted in a cost of \$1,381 per patient and a gain of 0.271 years of life expectancy, for a ratio of \$5,092 per year of life gained. The more aggressive strategy of screening with a 1 mm threshold for angiography resulted in a cost of \$3,077 per patient and a gain of 0.356 years of life expectancy, for an average cost of \$8,637 per year of life saved. In examining incremental

costs and gain in life expectancy, compared to the 2 mm strategy, the 1 mm strategy adds \$785 per patient and yields only 0.004 years of life, for a C/E ratio of \$187,300 per year of life saved. Therefore, the extra \$785 per patient may be better spent elsewhere in the health care system. The incremental C/E ratio for the screening strategy with a 3 mm ST-segment threshold for angiography, as noted, is \$5,092 per year of life saved. The incremental C/E ratios for the 2 mm and 1 mm strategies are \$11,263 and \$187,300, respectively. Even though the 3 mm strategy appears to be the most effective due to its low incremental C/E ratio, it is not as aggressive as the 2 mm strategy (the best buy at \$11,263). The author recommends that analysts interpret C/E ratios correctly, always perform sensitivity analyses, and measure every item of cost or effectiveness.

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